

THE TAMU WATER PROJECT:
CRITICAL ENVIRONMENTAL JUSTICE AS PEDAGOGY

A Thesis

by

MARISSA ISELA MUÑOZ

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

August 2010

Major Subject: Curriculum and Instruction

The TAMU Water Project:
Critical Environmental Justice as Pedagogy
Copyright 2010 Marissa Isela Muñoz

THE TAMU WATER PROJECT:
CRITICAL ENVIRONMENTAL JUSTICE AS PEDAGOGY

A Thesis

by

MARISSA ISELA MUÑOZ

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

Approved by:

Chair of Committee,	Lynn M. Burlbaw
Committee Members,	Bryan Boulanger
	B. Stephen Carpenter, II
	Dominique Chlup
Head of Department,	Dennie Smith

August 2010

Major Subject: Curriculum and Instruction

ABSTRACT

The TAMU Water Project: Critical Environmental Justice as Pedagogy.

(August 2010)

Marissa Isela Muñoz, B.S., Texas A&M University

Chair of Advisory Committee: Dr. Lynn M. Burlbaw

The TAMU Water Project is a trans-disciplinary collaborative that works to address the water needs of rural communities along the Texas/Mexico border called *colonias*. Modeled initially after the work of Potters for Peace, the TAMU Water Project recognizes access to potable water as a human right and is dedicated to the production, distribution, and research of affordable, appropriate technology to purify water.

This thesis proposes critical environmental justice as the theoretical framework and lens through which to examine the TAMU Water Project as a praxis of public pedagogy. Extant data in the form of articles, publications, presentations, photo essays, and video, were analyzed using an inductive process of content analysis and thick description to prove that the TAMU Water Project fulfills the criteria of critical environmental justice and can be used as an example of critical environmental justice as pedagogy.

ACKNOWLEDGEMENTS

I would like to thank my committee chair, Dr. Lynn M. Burlbaw, for his sincere and patient guidance through this process. Thanks also to my committee members, Dr. B. Stephen Carpenter, II, Dr. Dominique Chlup, and Dr. Bryan Boulanger, for their ideas and kind encouragement through the course of this research. Endless appreciation goes to my husband, Ben Bertka, and parents, Norma and Oscar Muñoz, and family for the unwavering support and encouragement to keep moving forward. Thank you, Water Project colleagues, community advocates, and water educators for your tireless work toward water justice. I am forever inspired to continue this work because “it is the right thing to do.” *Por todas mis relaciones.*

TABLE OF CONTENTS

	Page
ABSTRACT	iii
ACKNOWLEDGEMENTS	iv
TABLE OF CONTENTS	v
LIST OF FIGURES	vii
CHAPTER	
I INTRODUCTION.....	1
II METHODOLOGY	4
Data Collection.....	4
Emerging Themes Guide Literature Review.....	4
Analytical Process	7
Delimitations	9
III CRITICAL ENVIRONMENTAL JUSTICE	11
IV WATER.....	17
Water as a Universal Human Right.....	19
Water as a Commoditized Resource	21
Water as a Grassroots Non-Formal Pedagogy	23
V <i>COLONIAS</i>	29

CHAPTER		Page
VI	THE TAMU WATER PROJECT	37
	History of the Project	38
	Stark Gallery Event	39
	Recent Configuration	42
VII	ANALYSIS AND DISCUSSION	45
	Non-Hierarchal Approach	45
	Recognition of Indigenous Culture and Knowledge	51
	Recovery of the Community Commons	59
	Sustainability for Future Generations	63
	Discussion	65
VIII	CONCLUSION	69
	Metaphors	72
	Future Work	73
	REFERENCES	75
	APPENDIX A: TAMU WATER PROJECT ARTICLES AND MEDIA	82
	VITA	87

LIST OF FIGURES

FIGURE		Page
1	Lens of analysis and concentric rings of context framing this study	3
2	Inductive process of data collection and theory development	4
3	Thematic aspects of TAMU Water Project work.....	5
4	Theoretical development	6
5	Table of direct evidence	8
6	Conceptual model depicting intersection of educational theories.....	14
7	The All-American Canal divides El Centro, California, from Mexicali/Calexico, Baja California, Mexico	19
8	Round-bottom ceramic water filter used by TAMU Water Project.....	26
9	Linear binaries.....	31
10	Stark Gallery event, September, 2007.....	40
11	Bamboo rhizome	47
12	Mani kiln as appropriate technology	53
13	Indigenous knowledge and critical awakening in Esmeraldas, Ecuador ..	56
14	Use of indigenous knowledge and appropriate technology in Esmeraldas, Ecuador	57

CHAPTER I

INTRODUCTION

In the spring of 2006, by a fortuitous coincidence, Mr. Oscar Muñoz met Dr. B. Stephen Carpenter, II, at a recruitment event for the Texas A&M University Department of Teaching, Learning and Culture (Muñoz, O., personal communication, November 12, 2009). Muñoz had long worked as a community advocate for the underserved rural communities along the Texas-Mexico border, as the Deputy Director of the *Colonias* Program in the Texas A&M University Center for Housing and Urban Development. Carpenter, an associate professor of education and visual culture at Texas A&M University, had an undergraduate degree in ceramics, and was familiar with the low-cost, yet highly effective, ceramic water filters of Potters for Peace (Carpenter, B., personal communication, February, 23, 2010). Shared interest in collaboration led to a straightforward alignment between the need for clean water in the Texas *colonias* and the flexible and culturally sensitive solution implemented by Potters for Peace. As a result, the TAMU Water Project grew out of subsequent conversations. Carpenter writes,

The TAMU Water Project has based its approach on the work of Potters for Peace through the assistance of artists Manny Hernandez, and Richard Wukich....Central to the mission of the TAMU Water Project... is the development and implementation of appropriate technology to respond to real world living conditions....primarily in south Texas in the rural, low-income communities known as the *colonias* (2010, p. 337-338).

This thesis follows the style of *Taboo: The Journal of Culture and Education*.

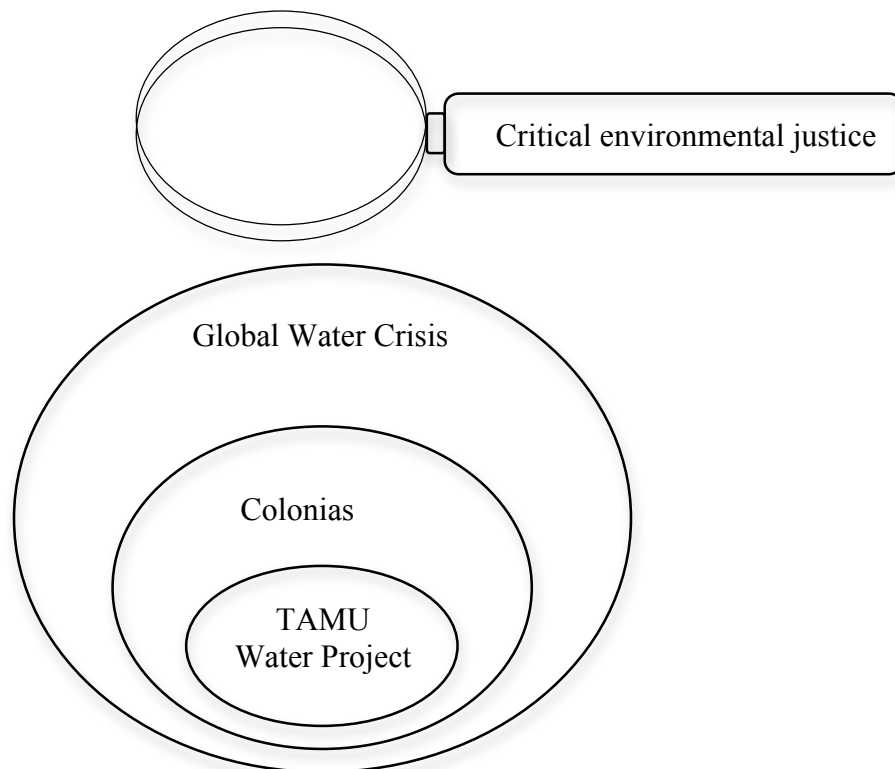
Today, the TAMU Water Project is dedicated to the production, distribution, and research of affordable, appropriate technology to purify water, recognizing access to potable water as a human right. Their work “addresses water issues in three ways: 1) through the research and production of point-of-use ceramic water filters, 2) through community activism and place-based solutions, and 3) through curriculum and work of public pedagogy to bring attention to the issue” (Muñoz, Muñoz, & Arcak, 2010).

This thesis proposes critical environmental justice as a theoretical framework and lens through which to understand how the TAMU Water Project functions as a praxis of public pedagogy. The history and extant artifacts of the TAMU Water Project will be analyzed as a possible example of what critical environmental justice may look like in practice. As a graduate student working with the TAMU Water Project, my intention is to step into the role of *participant observer* to uncover the interaction of significant factors and multiple sites of meaning characteristic of this interdisciplinary collaboration.

This study will focus on holistic description and explanation of the concentric rings of context framing the project, as it is “impossible to separate the phenomenon’s variables from their context” (Merriam, 2009, p. 43). This thesis is organized to present the tools, and situate the study, before analyzing the work of the Water Project itself (see Figure 1). Chapter II details the methodology of inductive analysis that supported the theoretical development, followed by Chapter III which advances critical environmental justice as the theoretical framework and lens through which to discern the pedagogical example. Chapter IV will introduce the largest of the concentric rings of context

surrounding the case study by examining the global water crisis. Narrowing our focus, Chapter V discusses the local manifestation of the water crisis in Texas communities called *colonias*. Chapter VI more fully describes the development of the TAMU Water Project, discussing how the structure of the organization influences the work for water justice with and within *colonia* communities. Chapter VII expands the analysis of extant material data, followed by conclusions and recommendations for future work in Chapter VIII.

Figure 1.
Lens of analysis and concentric rings of context framing this study



CHAPTER II

METHODOLOGY

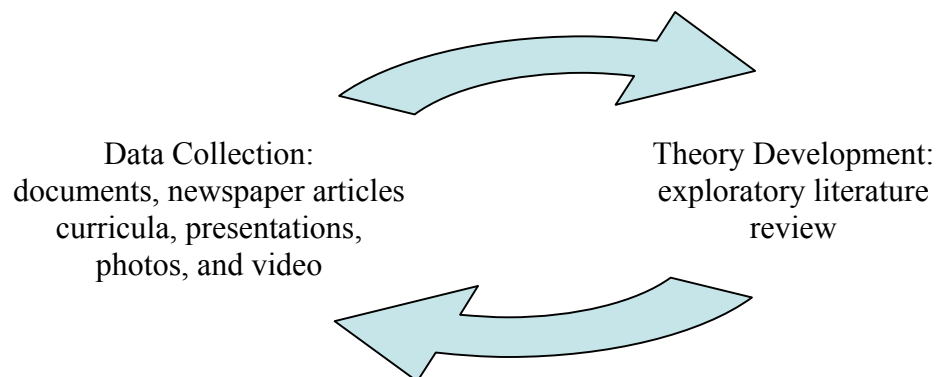
Data Collection

Since its inception, this thesis was intended to document the history and work of the TAMU Water Project. I chose to focus on the material evidence produced by the project, including documents written by participants, articles written about the work, presentations, curricula, photo essays, student works, blogs, and videos. As I found material, I collected a master list of the references in a spreadsheet, which are included in Appendix A.

Emerging Themes Guide Literature Review

The process of collecting data and selecting a theoretical framework was inductive and interdependent, occurring simultaneously (Figure 2). Various themes in the data prompted theoretical categories, which in turn influenced searches for data.

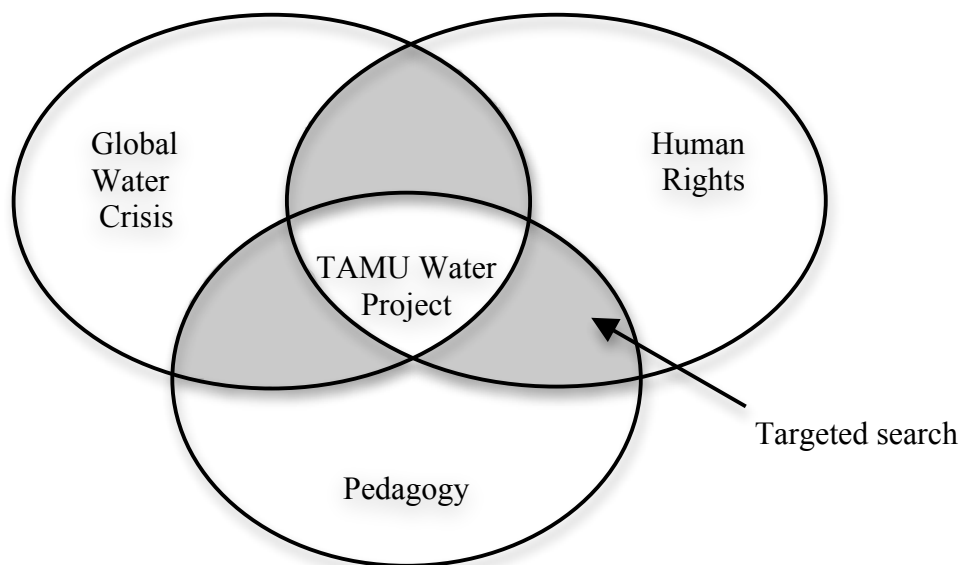
Figure 2.
Inductive process of data collection and theory development



Through the process of reading, sorting, and cataloging documentary evidence related to the TAMU Water Project, three distinct aspects of the work conducted by the project collaborators emerged: a global water crisis approach, a human rights approach, and a pedagogical approach. Concept maps helped to guide the process, graphically representing how the work of the project was situated within the themes (Figure 3).

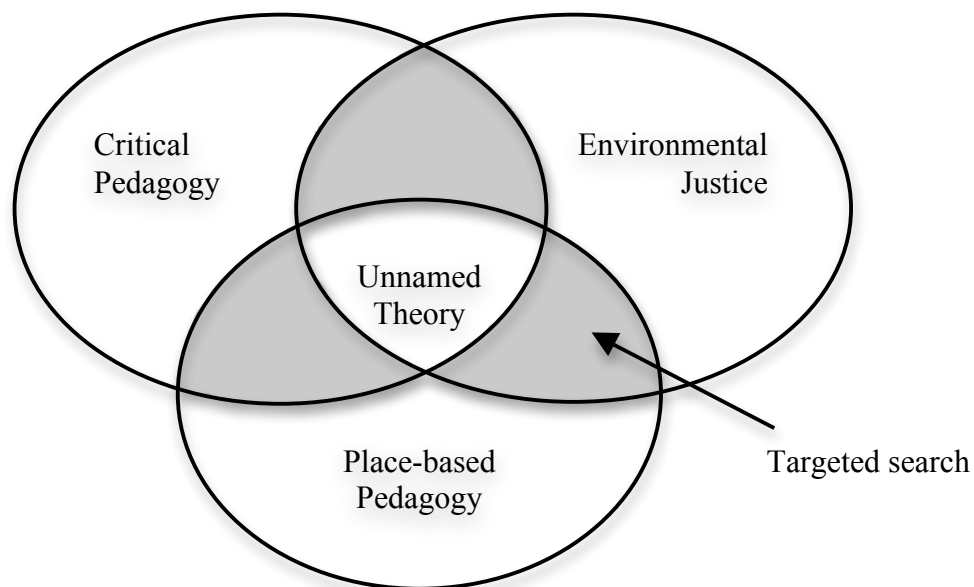
As I began to conduct the literature review, the most effective searches, being most closely related to the Water Project, occurred when I used a combination of any two of the categories related to my subject. For example, searching “global water and human rights” in combination yielded results that were much more relevant to the work of the TAMU Water Project than searches of either term separately. In effect, the concept map functioned as target, or bull’s eye, in guiding the research of literature.

Figure 3.
Thematic aspects of TAMU Water Project work



The process of collecting articles for the literature review included cataloging basic information into a spreadsheet to ease coding, sorting and synthesis. Through this process, similarities of theory began to emerge, eventually resulting in three distinct theoretical themes: critical pedagogy, environmental justice, and place-based pedagogy. Again, concept mapping was used to depict how the theories may relate based on the data, depicting the relatedness of possible theoretical frameworks (Figure 4). The work of the TAMU Water Project seemed to be situated in the intersection of all three theories, but searches to find previous work giving this theory a name revealed controversy amongst theorists.

Figure 4.
Theoretical development



Conceptually, the theories did not conflict, however, the intersection of critical pedagogy, environmental justice, and place-based education has not yet been explored. Thus, I borrowed from the closest similar theory, eco-justice pedagogy (Bowers, 2002), to resolve the discrepancy and create the niche for my study. While utilizing and expanding on the criteria of eco-justice pedagogy, I chose to rename it critical environmental justice to be mindful of the complex theoretical perspectives influencing this work from each of the contributing theorists.

Analytical Process

In selecting which particular evidence to use, the master list of material was examined and coded according to the following criteria:

- 1) What evidence related to the history of the Water Project is included?
- 2) Which direct quotes from the first-hand collaborators reveal the characteristics of the TAMU Water Project?
- 3) Which data reveals why collaborators are motivated to continue the work?
- 4) What metaphors are used to describe the Water Project?

The data was grouped according to similarity in overall understanding, as some articles written by outside observers revealed differing conceptions of the TAMU Water Project. In my role as a participant observer, I acknowledge my own bias in portraying a particular interpretation of data. These concerns are addressed through the use of a theoretical framework to guide analysis, collecting evidence to support specific criteria detailing how the TAMU Water Project functions as a praxis, unifying theory and

practice. Evidence was considered direct if it included first-hand account from one or more of the collaborators, or indirect if it was a first or second-hand interpretation.

Direct Evidence

First-hand accounts from the collaborators describing how their work with the Water Project was collected and organized in a spreadsheet according to which of the criteria were addressed. Information was considered within the context of the particular material data, as well as in relation to other evidence, and added to the spreadsheet accordingly (see Figure 5).

Figure 5.
Table of direct evidence

		Aspects of Water Project Work		
		Filter work	Community Advocacy	Curriculum and Education
Critical Environmental Justice	Criteria 1			
	Criteria 2			
	Criteria 3			
	Criteria 4			

Indirect Evidence

I searched for metaphors and other symbolic language used that illustrate representations of the work of the TAMU Water Project, and recorded the connections, depictions, and parallels made in the documentary evidence. In some cases, although an explicit metaphor was not used, the language suggested a particular conception similar to a metaphor, and indicative of the author's perspective. As a participant observer, thick description, rich in detail, was used to further contextualize discussion of evidence.

Delimitations

This thesis seeks to establish critical environmental justice as a praxis, illustrated through the example of the TAMU Water Project. As the theory is somewhat nascent, discussion will focus on aspects of the theoretical framework, rather than as an established practice of pedagogy. In cultivating a strong theoretical foundation with this thesis, I intend to further develop the pedagogical aspects over time, extending past the scope of this particular study.

Similarly, although the TAMU Water Project was established in 2007, much of the foundational work has occurred amongst the collaborators themselves, a majority of the work geographically centered in and around Texas A&M University, rather than in partner communities. While essential to community involvement, this early foundational work has resulted in evidence that focuses on future goals, intentions, and theoretical applications, rather than specific examples of practice. Furthermore, in these planning stages, there is little documentary evidence created by the participants of the TAMU

Water Project detailing how the project began, how it was developed, and has since evolved. Therefore, this thesis will focus on the theoretical aspects of praxis, and work of the TAMU Water Project from its establishment in 2007 until December of 2009.

CHAPTER III

CRITICAL ENVIRONMENTAL JUSTICE

“Metaphor is more than poetic color and superficial ornamentation. It shapes everyday discourse, and by this means, it shapes how people discern and enact the everyday” (Santa Ana, 2002, p. 26). In the past, education has been debated using various metaphors, each casting a particular understanding of the roles of both educator and learner. For example:

- Education as a medical practice, in which “we *test* and *diagnose* students in order to apply appropriate *treatments*. Students who are *deficient* are sent to a *lab* for prescriptive remediation.” (Slattery, 2006, p. xv);
- Education as a factory, in which standardized, teacher proof curricula are applied to students, as they are conveyed through schools, making approved, quantifiable yearly progress (Santa Ana, 2002); and
- Education as the banking method, in which the teacher deposits information into the empty receptacle of each student, and learning is a series of one-way transactions (Freire, 1998).

None of these metaphors describes the sociocultural influence of educators, or their practice of creating and embodying pedagogy. Bourdieu explains “the educational market is strictly dominated by the linguistic products of the dominant class and tends to sanction the pre-existing differences in [symbolic, material, and cultural] capital” (1982, p. 62). Thus, externally imposed conceptions of education function to maintain the social status quo, in which some populations benefit, while others do not. Ayers provides clarity to the dilemma:

Education, of course, lives an excruciating paradox precisely because of its association with and location in schools. Education is about opening doors, opening minds, opening possibilities. School is too often about sorting and punishing, grading and raking and certifying. Education is unconditional—it asks

nothing in return. School routinely demands obedience and conformity as a precondition to attendance (2001, p. xxiii).

The terms *education* and *school* are often conflated in order to conceal the contradictory purposes. Models of schooling based on medical, factory, or banking metaphors, although ineffective as models of education, remain firmly embedded in public discussions about education.

In the last fifty years, as the social context of the United States has shifted toward inclusive diversity, the paradigm of public education has progressed away from mandated assimilation and control. Slattery writes “The shift in focus to the active process of learning has never denied that texts, materials, lessons, tests, and classrooms are important; they are just not the substance of curriculum or the purpose of education” (2006, p. 62). Critical pedagogy emerged as an alternative to hegemonic educational practices, questioning the imbalance of power and marginalization perpetuated by the status quo.

Freire argued for “education as the practice of freedom - as opposed to education as the practice of domination” (1998, p. 75). He encouraged educators to base educational activities on issues that were immediately related to the learners’ lives. Dialectical discourse led to *conscientization*, or “the *emergence* of consciousness and *critical intervention* in reality” (Freire, 1998, p.75, emphasis in original). Theoretically, learners become active participants in the world, rather than passive objects acted upon by circumstance. Education becomes a dynamic process of reflective, reactive empowerment for both teacher and learner. Freire elaborates: “teaching in schools and universities is not a preparation for a future life; it must be, as Dewey wrote in

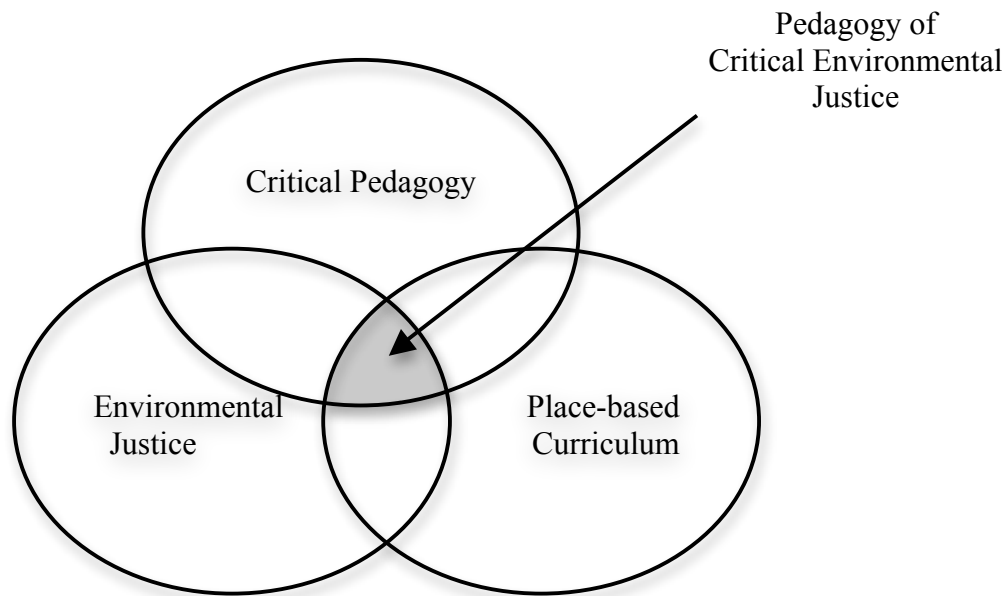
Experience and Education, an experience of life itself” (1998, p. xvi). In this conception, education is an awakening to and exploration of one’s own life (Freire, 1998), and the concentric circles of context in which we live (Ayers, 2001). Pedagogical practice is used as a means of challenging oppressive hegemonic systems, embodying “liberation [as] a praxis; the action and reflection of men and women upon their world in order to transform it” (Freire, 1998, p. 73; Ayers, 2001).

However, the process of conscientization does not guarantee liberation from all oppression. Greene (1998) warns we cannot assume that everyone will be moved to address injustice through the process of conscientization. Teachers must model “moving beyond self-interest to a consideration of responsibility as members, as citizens, or (sometimes in the extreme) as contemporary... resistance fighters” (Greene, 1998, p. xxviii). For others, the process of conscientization is not the problem. Gottlieb and La Belle synthesize multiple research accounts, concluding that collective critical awareness is limited when it “does not extend to needed structural transformation” (1990, p. 11), nor does it necessarily improve living conditions. Despite these uncertainties, to teach for social justice is “to teach so that the young may be awakened to the joy of working for transformation in the smallest places, so that they may become healers and change their worlds” (Greene, 1998, p. xlv).

In the last ten years, scholars have focused on the intersections of critical pedagogy with environmental justice and place-based curriculum, as indicated by the shaded area in Figure 6 (Gruenewald, 2003a, 2003b, 2005, 2008; McLaren & Houston, 2004; Stevenson, 2008). In doing so, the theoretical discussions of critical pedagogy

have been made applicable through context-specific, place-based practices for the purpose of creating environmentally sustainable solutions.

Figure 6.
Conceptual model depicting intersection of educational theories



This melding of theories has not gone without controversy, as each different scholar approaches the intersection from a different perspective (Bowers, 2002; Gruenewald, 2003a; McLaren & Houston, 2004; Gruenewald, 2005; Bowers, 2006; Gruenewald, 2008). Gruenewald (2003a) names the intersection a critical pedagogy of place advocating for decolonization and reinhabitation of place. McLaren and Houston name the intersection radical green revolutionary critical pedagogy, understanding “urbanization, racism, classism, sexism, environmentalism, global economics, and other

political themes" as they specifically relate to class inequality (2004, p. 35). Stevenson (2008) calls the intersection a critical pedagogy of environmental education, in the tradition of scholars from Australia, Canada, and the United Kingdom. By contrast, Bowers (2002, 2006, 2008) has for many years argued that eco-justice pedagogy is irreconcilable with the ethnocentrism and patriarchy of critical pedagogy, instead arguing for an eco-justice pedagogy that essentially addresses the same goals as the intersection in question. However, when considered as a whole, mindful of the limitations and embedded biases, the fields of critical pedagogy, environmental justice, and place-based curriculum are not exclusionary, sharing several key characteristics.

For the purpose of this study, I will call this intersection the pedagogy of critical environmental justice, which is practiced through conscientization and place-based curriculum. Modeled after eco-justice pedagogy (Bowers, 2002), the main characteristics of critical environmental justice are:

- 1) A Non-Hierarchical Approach, which is reflected in both the internal organizational structure and also the external community partnership models,
- 2) Recognition of Indigenous Culture and Knowledge, implemented using strength-based and culturally-relevant approaches,
- 3) A Recovery of the Community Commons, including non-commoditized aspects of public health, advocacy, and community empowerment, and
- 4) A Sustainable Ecology for Future Generations, evident in how the project nurtures the next generation, and minimizes its ecological footprint.

Bowers writes “The use of ecology as a root metaphor... foregrounds the relational and interdependent nature of our existence as cultural and biological beings. This includes our participation in a highly complex web of symbolic relationships deeply rooted in the past” (2002, p. 29). Thus, pedagogy is reconceived as a praxis of social justice that raises critical awareness to global and local issues, questions hegemonic structures, empowers marginalized communities, and seeks context-specific and culturally-sensitive solutions that are sustainable. The metaphor of education as an ecology of learning situates the practice within concentric rings of context centered on learners’ lives. In implementing a pedagogy of critical environmental justice, learners are awakened as global citizens, enabling a reflective, responsive, multidimensional understanding of local issues from a global perspective. Using critical environmental justice as the lens, we can now turn our attention to the multiple contexts surrounding and affecting our example, the TAMU Water Project. The widest of the rings of context is the global water shortage, which is an urgent concern to communities worldwide.

CHAPTER IV

WATER

Water is life, a fundamental need of all living things. Worldwide, demand for potable water far out reaches supply in most of the world's major population areas. The finite supply of freshwater is being pumped, diverted, and contaminated at a much faster rate than can be recharged by the natural water cycle, resulting in a global water shortage. Scarcity has motivated privatization, making potable water available to those who can afford it, leaving millions of people without the means or access to safe drinking water. This global context provides the widest lens through which to understand the work of the TAMU Water Project.

Gleick, referencing the United Nations, writes,

An estimated 14-30 thousand people, mostly young children and the elderly, die every day from water-related diseases. At any given moment, approximately one-half of the people in the developing world suffer from disease caused by drinking contaminated water or eating contaminated food (1999, p. 488).

Scanlon, Cassar, and Nemes (2004) reiterate the UNESCO statistics in their discussion of the legal challenges that policy makers face in addressing world water equity.

However, statistics alone do little to portray the complex, context-specific challenges in the quest for clean water. “In the vicious poverty/ill-health cycle, inadequate water supply and sanitation are both underlying cause and outcome: invariably, those who lack adequate and affordable water supplies are the poorest in society” (UNESCO, 2003).

In examining the research about water issues for this thesis, three distinct approaches emerged: water discussed as a legally enforceable universal human right,

water as a commoditized resource protected by monetary value in the free market, and water as grassroots non-formal pedagogy.

Water as a Universal Human Right

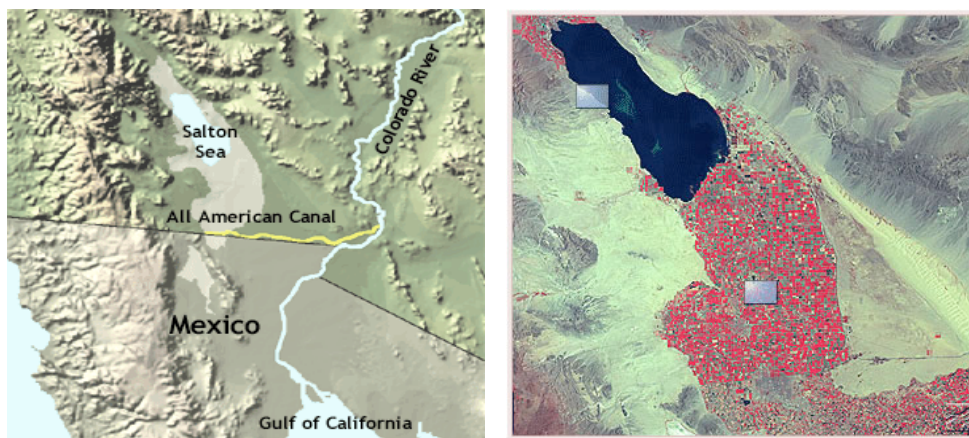
Historically, the human right to water has not been fully defined according to international law, nor protected as other human rights issues have been (Bluemel, 2004; Gleick, 1999). The right to water has been considered subordinate to the other rights, such as the right to food, and right to life's basic necessities (Hardberger, 2004). While governments are legally and ethically bound to enforce and protect human rights, they cannot do so without clear policies in place. Creation of an international human right to water would necessitate obligation to respect, to protect, and to fulfill the water rights for all people (Bluemel, 2004), while ensuring standards of quantity and quality for each person (Gleick, 1999). In considering the logistics and policies likely to be adopted internationally, "the amount of water supported by this right... ensures only the barest minimum quantity of affordable water—that necessary to support life—and therefore does not ensure water sufficient for personal consumption or even for all forms of hygiene" (Bluemel, 2004, p. 968). In addition, different cultural standards of living influence distribution, use, and regulation. As with everything in the open market, equitable does not mean equal.

Gleick warns against the possibility of overuse, "A right to water cannot imply a right to an unlimited amount of water. Resource limitations, ecological constraints and economic and political factors limit water availability and human use." (1999, p. 494-

495). Furthermore, freshwater resources such as surface water and ground water are often shared between international neighbors. “With so many shared water resources, it is important to understand the responsibility of one country to provide necessary water for a neighboring country, especially when the latter does not have the resources to provide for itself” (Hardberger, 2004, p. 542-543).

Unequal power relations often shift loss onto the lesser powerful party (Garcia-Acevedo & Ingram, 2004), which is precisely the cause of a long-standing disagreement and water treaty between the United States and Mexico. In the 1940s, the All American Canal was built parallel to the border, 160 miles east of San Diego, to provide water to the most arid regions of southern California.

Figure 7.
The All-American Canal divides El Centro, California, from Mexicali/Calexico, Baja California, Mexico



(National Atlas of the United States. (2009).
http://nationalatlas.gov/articles/agriculture/a_ivalley.html#one)

Much of the eighty-two mile canal is earthen, which allows some of the surface water to be absorbed, feeding the groundwater supply of the greater area, which includes 50,000 acres of farmland and half million people who live in the Mexicali Valley of Mexico. Similar to other border “sister cities,” El Centro, California and Mexicali/Calexico, Baja California, have grown together, appearing as one large metropolis in the satellite image (Figure 7). At the time the canal was built, the cities were much smaller, and Mexico agreed to repay the United States 350,000 acre-feet of water each year, as the canal is the only source of freshwater in the greater area. It seemed reasonable at the time, with no way of predicting the explosive population growth, or the severity of the long term-drought that would make the terms of the agreement impossible.

The United States, being the more powerful partner in the contract, held firm to the terms of the agreement, in spite of many years of severe drought. An enormous water debt has since amassed, prompting the construction of a concrete canal parallel to the earthen one, designed to “recapture the fugitive resource” (Garcia-Acevedo & Ingram, 2004), and scheduled to be completed mid-2010 (Parsons, 2009). Completion of the project will certainly benefit the ever-increasing population of southern California at the cost of desiccating their Mexican neighbors. Clearly, the enforcement of a universal human right to water would dramatically alter international dynamics by demanding respect, protection, and fulfillment of water for all people, regardless of their nationality and/or their access to wealth.

Water as a Commoditized Resource

Many countries (including the United States) currently classify access to potable water as a need, rather than a right (Access to Water, 2009; Garcia-Acevedo & Ingram, 2004), offering little protection or assurance of access for all people. At the 2009 World Water Forum, twenty countries in attendance submitted a challenge to the Forum's Ministerial Declaration, insisting that water be recognized as a human right, rather than a need, as it was presented at the conference. The United States, European Union, Canada, and Brazil abstained from the challenge, content to keep water defined as a need. In examining the conference materials available online, the water crisis is addressed only in terms of economic development and growth goals. People, and the impact on their lives, are altogether excluded from the discussion (Access to Water, 2009).

When water is regarded as a need, the language shifts into the vocabulary of economics and market metaphors: the finite supply of worldwide freshwater is being pumped, diverted, and contaminated at a much faster rate than can be captured as value by the market. Bluemel explains, "Treating water as an economic good was designed to promote conservation and greater sustainability of water resources by making waste more expensive" (2004, p. 963). Scarcity of water is managed through commodification and privatization, to be sold to the public. However, if water is perceived solely as an economic good, then access may be determined by market forces, without regard to equity or need, inherently excluding many people from access to water. For example, in a report called *Marketing Safe Water Systems: Why is it so hard to get safe water to the poor - and so profitable to sell it to the rich?*, Heierli writes:

The booming water markets can bring home the lesson that if 'pure' water has become a lifestyle product, linked to ambition, prestige and status symbols, [people will pay for water]....'solutions for the poor'....[do] not work. Nobody wants to be poor and buy a product for the poor – least of all the poor themselves. Their ambitions are to be like rich people; it is from the rich that they copy attitudes, not from their poorest neighbors (2008, p. 21-22).

Heierli assumes every person is motivated by prestige, desire, and status. Capitalism is assumed as universal worldview fulfilled by commodification and consumption of goods, which is a common characteristic of arguments for water as a need. While true for some, ownership is not the central motivation for all cultures. This representation of water as a good often prioritizes profit over peoples' lives, offering little hope and limited access to the millions of people who endure the cycle of poverty/ill health, as described by the UNESCO World Water Assessment Programme (2003).

In 1990, the World Health Organization/UNICEF Joint Monitoring Programme for Water Supply and Sanitation (JMP) was created to monitor and help countries increase water access and sanitation. The purpose included promoting water as a human right and economic development models, and the establishment of the Millennium Development Goal (MDG): “to halve, by 2015, the proportion of people without sustainable access to safe drinking-water and basic sanitation” (Scanlon, Cassar, & Nemes, 2004; WHO/UNICEF, 2010, p. 2). In the 2010 JMP update, the report suggests slow progress toward the goals, indicating that the MDG is not likely to be met in the next five years. While the Programme does address the water crisis from both the human rights perspective as well as the economic development perspective, it lacks a plan of implementation that includes the interpersonal relationships necessary to generate lasting social change. It lacks the transformative power of an educational component.

Water as a Grassroots Non-Formal Pedagogy

Education solves the water dilemma in reverse of the legal and economic models: rather than changing the structure and waiting for the systemic change to impact people's lives, education empowers people, who in turn, affect the larger systems according to their specific needs. Educational practitioners focus on interpersonal relations as a means of empowerment, leading to collaborations within and between communities, creating socio-cultural change as a grassroots movement. Ely-Yamin explains, "The very core concept...[of] education, implicates empowerment...In fact, human rights now appear as *a* if not *the* necessary means of protecting and affirming human integrity in the face of hostile social, economic, and political forces" (1993, p. 645), especially in regard to water rights.

Similarly, curricula focused on water safety, purification, sanitation, and related issues, allows educators to facilitate immediate changes to the daily habits of learners. Education that teaches the tools to obtain and maintain access to potable water benefits the health of the entire community, and is often implemented in non-formal and informal educational settings, such as community centers and homes, in which learners of all ages can benefit. Ideally, this critical awakening is at once empowering and transformative for both individuals and communities as a whole. Care must be taken so as not to impose ideological values upon the learners. To do so would contradict their right to freedom of thought, resulting in an additional layer of, rather than an alleviation of, oppression. In spite of this limitation, much progress can be made through pedagogy by focusing on skills and tools that make clean potable water accessible to all people.

Similarly, water can be addressed through place-based education that “embrace[s] the experience of being human in connection with the others and with the world of nature, and the responsibility to conserve and restore our shared environments for future generations” (Gruenewald, 2003a, p. 6). Dimensions of focus may include individual cases, creating awareness within and between disempowered communities, and or by challenging social structures. Gruenewald explains, “Place-based pedagogies are needed so that the education of citizens might have some direct bearing on the well-being of the social and ecological places people actually inhabit” (2003a, p. 3). Thus, solutions to the water crisis are developed from within, according to the needs of the people and resources of the particular place, rather than waiting for change to be imposed from outside entities, which may or may not serve the best interests of community. Similarly, methodologies such as community based participatory action research (May, Bowman, Ramos, Rincones, Rebollar, & Rosa, 2003; Sumaya, Carrillo-Zuniga, Kelley, May, Zhi, & Donnelly, 2006) work well in attending to the water needs of underserved communities by focusing on empowerment and transformation.

Considering the worldwide statistics that approximately 5,000 children die every day due to water related illness, a majority of which are preventable (UNESCO, 2009), timing is crucial. Waiting for the legal or economic systems to adjust social structures is a perilous undertaking; changes that benefit marginalized communities are not likely to occur if water rights are in conflict with economic plans. Losses and risks are often forced upon those who wield the least power, whether between nations, communities, or amongst individuals. Time may become a deciding factor, shifting the focus away from

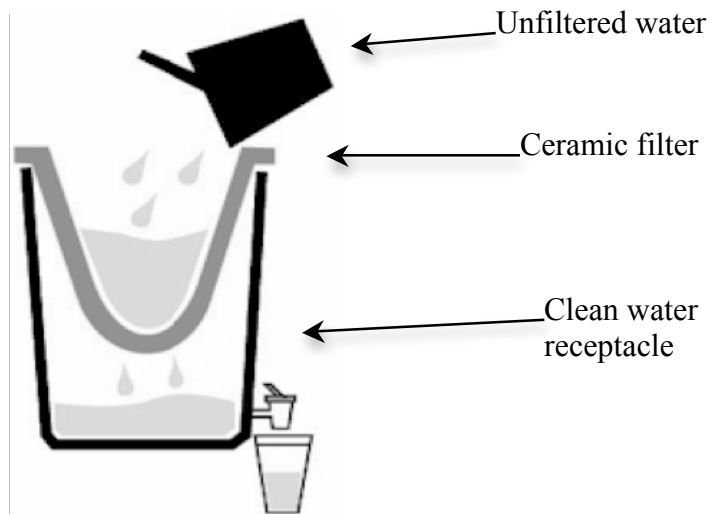
large-scale systemic changes, instead favoring the grassroots educational approach that can affect change in the lives of individuals from one day to the next.

Water as a non-formal pedagogy of place-based solutions has proven effective in creating long-term improvements to community health. Examples of place-based water solutions include the use of solar stills for purification (Foster, Amos, & Eby, 2005); safe chlorination as a disinfectant (Leonard, Vera, Liebman, Bessenecker, & Mercado, 1996; Quick, 1996); or by relying on *promotoras* as community health advocates to assist in facilitating the best context-specific solution to the issue of water access (May, Bowman, Ramos, Rincones, Rebollar, Rosa, et al., 2003; Sumaya, et. al. 2006; Vanegas, 2009). Unlike the legal or economic models, the educational model does not rely on structural change, instead depending on interpersonal relationships to create change one home at a time, and one community at a time.

One successful example of water as a non-formal educational movement is the work of Potters for Peace, a non-profit organization dedicated to improving potable water access for communities in need. Established in 1981, the group uses an open-source manufacturing model to teach communities about water safety, the use of ceramic point-of-use water filters, and guides community members in building facilities for the manufacture of such filters. Each water filter is made with low-cost, appropriate technology, utilizes local materials, and is modeled after the design of Dr. Francisco Mazariegos of the Central American Industrial Research Institute in Guatemala. Mixing equal parts of clay and local combustible material, such as fine sawdust or rice husks, the clay is formed into a twelve inch tall filter form. (Originally, PFP used a flat-

bottom design, but recent work by Mr. Manny Hernandez has modified this into a rounded conical shape.) Around the outer edge of the cone is a lip designed to allow the filter to sit inside of a large water collection receptacle (see Figure 8). In the firing process, the clay particles fuse to each other, while the organic material is burned off, leaving a semi-porous network of tiny channels throughout the clay body. To further ensure the antimicrobial properties, each ceramic filter is coated with a solution of colloidal silver. "Even without application of colloidal silver and using a relatively heterogeneous soil to manufacture the filter, the filters were able to remove between 97.86% and 99.97% of the total amount of *E. coli* in the influent water" (Oyanedel-Craver & Smith, 2008, p. 927).

Figure 8.
Round-bottom ceramic water filter used by TAMU Water Project



(Filter Pure. (2009). <http://filterpurefilters.org/>)

The non-hierarchical, non-proprietary educational approach is successful because it revolves around empowering individuals and communities with place-based solutions.

According to the Potters for Peace website:

Potters for Peace has since provided consultation and training to set up production facilities around the world: Guatemala, Honduras, Mexico, Cambodia, Bangladesh, Ghana, El Salvador, the Darfur region of Sudan, Kenya, Benin, Yemen, Nigeria, Tanzania, Peru, Somaliland and others. The CWP [ceramic water purifier] has been cited by the United Nations' Appropriate Technology Handbook, and hundreds of thousands of filters have been distributed worldwide by organizations such as International Federation of the Red Cross and Red Crescent, Doctors Without Borders, UNICEF, Plan International, Project Concern International, Oxfam and USAID (Potters for Peace, 2006).

Water, when addressed as a non-formal grassroots pedagogy has the potential to affect change relatively quickly compared to legal or economic approaches. Content can take the form of human rights or place-based curricula, empowering learners to affect change within the contexts of their own lives. With specific regards to the use of education to address water issues, even one single lesson has the potential to alleviate the incidence of water-borne illness, illustrating the ability of education to affect positive social change.

The finite limits of our global water supply become more obvious over time, and water-related issues are often addressed in both mainstream media and academia in three distinct ways: as a legally enforceable universal human right, as a commoditized resource in the free market, and as grassroots pedagogy. Whereas both the legal rights and economic models rely on structural changes, requiring long periods of time before improvement is observed in the lives of people, the educational approach is unique in the potential to affect positive change immediately. Considering the global usage, need, and

disparity in access, water issues will only continue to intensify, demanding new conceptions of understanding, new innovations in its protection and management, and new solutions to address the needs of the global community that must share this vital resource.

To understand the social dynamics that affect access to water within a specific community context, we will next focus on the communities that the TAMU Water Project strives to assist. In doing so, we will understand both the theoretical motivations (access to water as a grassroots pedagogy) and practical applications (within the context of specific communities) that make up the praxis of public pedagogy embodied by the Water Project.

CHAPTER V

COLONIAS

Nearly half a million people live along the U.S. side of the Texas /Mexico border in small, unincorporated, rural communities. In the past fifty years, increasing populations have sought affordable housing alternatives. Low-income families have often found affordable plots of land in rural areas, far enough from the city that they can own, rather than rent, their home without the burden of city taxes. These little communities are called *colonias*, which in Spanish, means “neighborhoods.” The Office of the Texas Secretary of State defines a *colonia* as “a residential area along the Texas-Mexico border that may lack some of the most basic living necessities, such as potable water and sewer systems, electricity, paved roads, and safe and sanitary housing” (What is a *Colonia*?, n.d.).

The oldest *colonia* communities were first developed in the 1950s, and for many years, little was done to address the needs of these communities surviving in the periphery of metropolitan development (What is a *Colonia*?, n.d.). Since 2000, several state-funded programs have been created, to assess and serve *colonia* needs, yet success was limited, as each community is distinct culturally from the United States, from Mexico, and from each other. In order to establish a more accurate representation of life in the *colonias*, Texas Senate Bill 827 was signed into law in June of 2005, requiring for the first time that *colonias* be systematically identified, assessed for health risks, and that demographic data about the residents be collected and entered into a database every

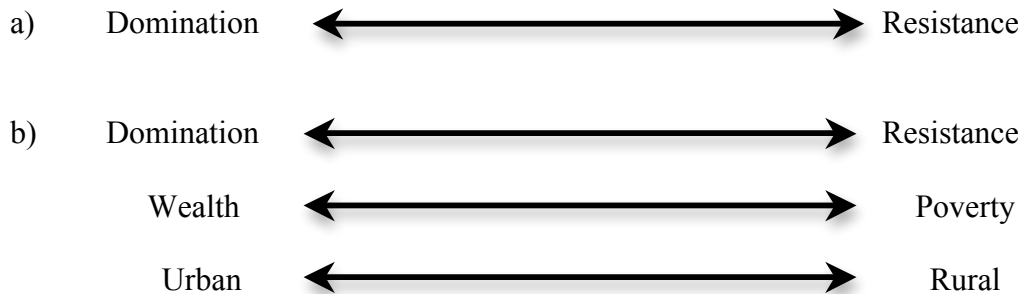
even-numbered year. Previous to this legislation, *colonias* were relatively invisible, and often misunderstood due in large part to stereotypes of poverty and illegal immigration along the border. According to Brown, in much of what has been written about the U.S./Mexico border:

there exists one common thread, false perceptions of the border based on mythology....[that it is] drowning in the filth of a putrescent Rio Grande glow with toxic waste; it is terminally ill with a rampant pox of poverty known as *colonias*;.... swarms of huddling illegals poise nightly to pour northward across the border to overwhelm American social services and steal jobs from honest workers while free-loading on the largess of American tax-payers (1997, p. 107).

Poverty is a confounding characteristic in the *colonias* that is sometimes conflated with laziness (as discussed in Brown, 1997), dumbness (Schmidt & Scott, 2000), defiance (as discussed in Campbell & Heyman, 2007), or seen as a lifestyle of one's own choosing (as discussed in Moreno, 2004). Each is a cultural misunderstanding stemming from ethnocentric assumptions, and each is a stereotype firmly embedded in dominant American culture. Only recently have scholarly studies moved away from objectifying people who live in poverty, by using first-hand personal accounts to support or disprove their conclusions.

Traditional models of social research rely on classifications based on linear binaries such as wealth/poverty, urban/rural, naturalization/resistance, etc., in which each of the oppositional terms occupies one end of a spectrum (Figure 9a). Recent ethnographic fieldwork, in particular, has overemphasized the role of domination/resistance in describing power dynamics in marginalized communities.

Figure 9.
Linear binaries



The oversimplification of complex, interrelated issues into a linear model misrepresents differences between populations and cultures by grouping dissimilar characteristics (Figure 9b). Sociologists Campbell and Heyman challenge this norm, citing the many cultural misunderstandings encountered when *colonia* residents were enumerated by the census. In attempting to collect data, census workers visited *colonias* and were faced with homes, yards, house numbers, streets, and responses that were not within their frame of reference. The demographic data collected reflected assumptions and biases in the types of questions asked, multiple-choice answer options available, and resulting demographic data that did not accurately represent the *colonia* communities. Models consisting of linear binaries have “resulted in widespread distortion of ethnographic material, notably by analysts forcing accidental defiance, avoidance, and similar phenomena into [the category of] resistance, a category best reserved for actions and meaning that actors themselves understand to be defiant” (2007, p. 4). In other words, linear binaries do not account for differences in worldview (culture, values, priorities, lifestyle, opinions, and self-identification) resulting in misunderstanding and

misrepresentation. Residents of the *colonias* may not fit, nor should they be forced to fit, theoretical models with such narrowly defined parameters.

While there are recent and increasingly more scholarly articles about the *colonias*, most articles portray life for the residents inaccurately by focusing exclusively on quantitative measures of poverty, making generalizations based on statistics alone (see for example Schmidt & Scott, 2001; Sumaya, et. al.2006; discussion in Williams, 2006). According to the Texas A&M University Center for Housing and Urban Development Director Jorge Vanegas:

Poor economic conditions, limited economic opportunities and low income, combined with limited mobility, limited literacy and fluency in English, and limited understanding of, information about, and access to basic services and programs of town, school, and agency office systems have contributed to perpetuate the current isolation of *colonia* residents. Their quality of life many times is reduced to mere statistics that do not capture the human dimension of their plight, making the reality of life in the *colonias* mostly unknown to anyone outside their boundaries (2009, p. 2).

Inevitably, stereotypes of the border, in combination with embedded biases, have created a self-perpetuating cycle of misunderstanding. In order to better understand the issues faced by *colonia* residents, we must first replace assumptions and stereotypes with open inquiry, recognizing *colonia* residents as people before they are considered as research subjects.

In 1991, the Texas State Legislature created the *Colonias* Program within the Center for Housing and Urban Development (CHUD), for the specific purpose of understanding the site-specific needs of each *colonia* (Vanegas, 2009). With the help of the TAMU CHUD *Colonias* Program, the first benchmark study was published in 2006 in response to Texas Senate Bill 827. The second study is expected by the end of 2010,

and will be updated every four years after. We now know that there are over 400,000

Texas *colonia* residents who live in more than 2,333 *colonia* communities along the

Texas border (Williams, 2006). According to the Texas Secretary of State:

- 64.4 % of all *colonia* residents and 85 % of those residents under 18 were born in the United States,
- the annual per capita income in the *colonias* is often half that of the state average,
- many residents buy water in bulk to meet their daily needs or use wells that may be contaminated,
- homes are usually constructed by the residents themselves, using materials as the residents can afford them or as they become available,
- Texas Department of Health indicate a high incidence of hepatitis A, salmonellosis, dysentery, tuberculosis, cholera and other diseases,
- the unemployment rate in some *colonias* is more than eight times the state rate,
- most *colonias* properties were financed as contract for deeds (in which the seller retains the title until the last payment), often with very high interest rates,
- in some instances, the cost to extend and maintain water services may be prohibitive, but often even *colonias* along and within city limits are excluded,
- within the state of Texas, homes that are not up to safety codes are not eligible for indoor plumbing and water service from the city,
- in most cases, developers created unincorporated subdivisions on land that was agriculturally worthless, such as on a floodplain (*Colonias* FAQs, n.d.) or toxic waste sites (Moreno, 2004)
- *colonia* residents do not pay city taxes, therefore, municipalities intentionally exclude rural areas from water service. Furthermore, rate regulation of water services, which makes service affordable to many urban residents, is a major factor in lack of coverage among the rural poor (Olmstead, 2004).

Yet, even these generalized statements do not portray the complete picture. *Colonia* residents remain anonymous subjects for researchers to analyze from an objective distance, generalizing across contexts that are widely disparate, usually producing conclusions that are inaccurate. Such “bundling” of data misrepresents the challenges faced by *colonia* residents, and therefore, is unable to suggest any relevant improvements. However, if the power structure and embedded stereotypes were neutralized, we might understand *colonia* residents as people before research subjects.

When research is focused in observation, active listening, and thick description, a more nuanced layering of understanding emerges. Denzin and Lincoln explain:

A thin description simply reports facts, independent of intentions or circumstances. A thick description, in contrast, gives the context of an experience, states the intentions and meanings that organized the experience, and reveals the experience as a process. Out of this process arises a text's claims for truth (1998, p. 324).

Focusing on the concentric rings of context surrounding a person minimizes the influence of inaccurate preconceptions, shifting the purpose away from what the researcher thinks they know. Thick description “involves challenging the abstractions that carry forward past misconceptions, prejudices, silences and stereotypes that are encoded in metaphors” (Bowers, 2008, p. 330). Careful observation that produces thick description necessitates closer proximity to the subjects than does a thin description. Consider the following interview excerpt between a *colonia* resident and a journalist researching environmental racism related to *maquiladoras* (U.S. owned factories):

“If I had the money to move to Corpus Christi, I’d be living there” said Zulema Tovar, 40, as she sat outside her corrugated tin house, holding her 5-month-old daughter Yesenia.... Several of Tovar's toenails softened and fell off [last month]. She believes that happened because of the contaminated floodwater she had to walk through for days... “Nobody ever told us anything about the flooding,” Tovar said. “I guess people would say [about us], ‘They should have known better.’ But...we’re trying to do the best we can.” (Moreno, 2004, pp.A3)

Not only is Zulema Tovar aware of her disadvantage and impoverished situation, but she is also aware of the perception and judgment of others against her. Had the journalist not visited the communities and interviewed residents, much of the nuanced data related to personal attitudes, community observations, and the emotions of resident Zulema Tovar would have been overlooked.

The work of community health workers called *promotoras* has been invaluable in successfully designing, implementing, and analyzing culturally-relevant, context-specific solutions to many *colonia* issues (May, et al., 2003; Mondragon, & Brandon, 2004; Sumaya, et. al., 2006; Vanegas, 2009). *Promotoras* are “residents who are recruited, hired, trained, developed, and deployed as Outreach Workers... through friendly, door-to-door...neighbor-helping-neighbor service” (Vanegas, 2009, p. 11). Resources provided through the CHUD *Colonias* Program include educational services, employment services, health services, youth and elderly programming, and community development, implemented directly with the help of *promotoras*. In the past five years, this community advocacy approach has successfully empowered residents, improving the quality of life within their communities (Williams, 2006).

As each *colonia* neighborhood negotiates a distinct set of concentric contexts, solutions for one *colonia* may or may not work for another. Foster, Amos & Eby (2005) have long advocated the use of solar stills to purify water, proving long-term viability in the *colonias*. Leonard, Vera, Liebman, Bessenecker, & Mercado (1996), Quick (1996), and Sumaya, Carrillo-Zuniga, Kelley, May, Zhi, & Donnelly (2006) have each conducted studies and implemented curricula about water contamination and treatment using chlorination. Others rely on community participatory research facilitated by *promotoras* to determine the best options for their community. In each case, place-based solutions are customized according to the needs and resources of each community, ensuring success.

Considering that there are nearly half a million people who live in Texas in over 2,300 distinct communities, along the 1,254 mile international border (Williams, 2006), a uniform, standardized response is not likely to provide long term solutions for the diverse issues facing *colonia* communities. The Texas A&M *Colonias* Program, and by extension, the TAMU Water Project, seek to address the water needs of *colonias* utilizing the *emic* perspective and cultural expertise of *promotoras* as well as the extant network of community centers, through which to research and implement place-based potable water solutions for the *colonia* communities.

To understand the TAMU Water Project, I have discussed the framework of critical environmental justice, the implications of the global water crisis, as well as the factors influencing work with the Texas *colonias*. We will now turn our attention to the project itself, so as to understand how the organization functions in response to the multiple layers of context, operating as a praxis of public pedagogy.

CHAPTER VI

THE TAMU WATER PROJECT

A pedagogy of critical environmental justice encourages a place-based praxis of conscientization as a critical awakening to and exploration of life itself, empowering thinkers as engaged and active participants in shaping their world. Giroux posits:

It is imperative that public intellectuals within and outside of the university defend...education as a democratic public sphere, connect academic work to public life, and advance a notion of pedagogy that provides students with modes of individual and social agency that enables them to be both engaged citizens and active participants in the struggle for global democracy (2009, p. 14).

Through praxis, both learner and educator are simultaneously empowered to affect positive social change within the contexts of their own lives.

The TAMU Water Project emerged as a creative and embodied response to local and global water issues. When they created the Water Project, Carpenter and Muñoz did not have a clearly defined idea of how their partnership would grow and develop over time. Instead, they focused on the single goal of using the Potters for Peace water filters to provide potable water to the *colonia* residents, allowing the workplan to evolve organically. In so doing, the project straddles academic and public spheres, engaging participants in and around the Texas A&M University campus in conscientization, empowered as global citizens, working toward water justice.

History of the Project

The TAMU Water Project began as a collective modeled after the outreach aspect of Potters for Peace. Since its inception in 1986, Potters for Peace (PfP) has served as an educational hub relying on a network of volunteers who trade time for living accommodations in communities worldwide for the purpose of teaching, building, and developing ceramic water filter production facilities. In 1998, Hurricane Mitch devastated Nicaragua, Guatemala, and Honduras, prompting PfP to mobilize humanitarian efforts in the region. Professor Richard Wukich (Slippery Rock University) volunteered to travel with Potters for Peace, during which time he met PfP Coordinator Ron Rivera, and Professor Manny Hernandez (Northern Illinois University) (Wukich, 2008). The experience was transformative, shifting Wukich's career as an art professor toward water justice issues and establishing long-term collaborations with Rivera and Hernandez. In subsequent years, the three travelled extensively to many countries, teaching people about water filters, and teaching communities water filter production using local materials.

In the spring of 2006, by a fortuitous coincidence, Carpenter met Muñoz at a Texas A&M University event. Carpenter, an associate professor of education and visual culture, had a professor/friend/mentor named Wukich who had worked with Potters for Peace, building low-cost, highly-effective ceramic water filters (Carpenter, B., personal communication, February, 23, 2010). Muñoz, the Deputy Director of the Texas A&M University CHUD *Colonias* Program, had many years experience as a community advocate, working to provide resources and services to rural communities along the

Texas border. In meeting each other, their conversations planted the seeds of a collaboration that would eventually grow into the TAMU Water Project.

Early efforts of the TAMU Water Project included learning the filter-making process from Hernandez and Wukich, as well as coordinating efforts in order to increase local support and participation in the project. The collaboration between Carpenter and Muñoz soon grew to include other faculty, students, community partners, and volunteers, each interested in contributing to the collective efforts in support of water justice.

Stark Gallery Event

In 2006, Wukich curated a travelling exhibition featuring water vessels created by well-known ceramic artists to raise awareness of global water issues. In addition to his continued travel establishing water filter facilities, Wukich intended the art exhibit to combine art with a humanitarian purpose, reaching populations that may not be aware of the scale or severity of water issues. This exhibit served as the foundation of the first public event organized by the TAMU Water Project, which took place in fall of 2007. Carpenter, Muñoz, Hernandez and Wukich planned several public events to complement the gallery exhibition, scheduled for display in the Texas A&M University J. Wayne Stark Galleries during September and October of that year. A two-day symposium was offered to the public, bringing together “artistic, community, economic and education leaders to discuss low-tech solutions to provide safe water” (Kujawski, 2007). Part of the symposium took place as a public demonstration in the courtyard of the Memorial Student Center, immediately outside of the doors of the Stark Gallery.

Figure 10.
Stark Gallery event, September, 2007



a) Setting up in front of Stark Galleries. b) Mixing the dry ingredients.



c) Wedging the clay mixture. d) Pressing the clay into a filter.



e) Air-drying the new filters. f) TAMU Water Project, Fall 2007

(Carpenter, B. S. (2007). Stark Gallery Event. <http://picasaweb.google.com/bscarpenterII/TAMUWaterProjectImages?authkey=aAJ4uKn-UmM#>)

During the planning process, the event was called a “public demonstration” in order to attract passers-by and participants. However, as people stopped, worked with the clay, and began to see filters produced by the collective effort, the coordinators realized that the event was much more than just a demonstration. Some “audience” members stayed the entire afternoon, working, talking, asking questions, etc., easily integrating themselves into the process of filter production. Looking back on the event, Carpenter explains, “public events include the participation of observers and passers-by who are initially intrigued by the visual spectacle they encounter, but stay and participate in the educational experience” (2010, p. 340). Each participant was learning by doing, examining water issues beyond the contexts of their own lives.

Months would pass before the TAMU Water Project collaborators reflected on, described, and discussed what had happened during the event. In the photos (see Figure 10), it is difficult to distinguish TAMU Water Project collaborators from audience participants. The openness of the arrangement of equipment seemed to invite people in, blurring the distinction between learner and educator, creating a style of public “demonstration” that would become a signature of the TAMU Water Project.

The Stark Gallery event was successful in generating interest and enthusiasm in the project. Soon after the event, Carpenter and Muñoz decided to meet regularly. Rather than a traditional meeting on campus, Water Project meetings would take place around and during filter production. In order to accommodate this, Carpenter offered the garage of his home. Meetings are called Filter Fridays, and more than two years later, continue to take place as hands-on filter production working meetings.

Recent Configuration

A few months after the Stark Gallery demonstration in 2007, while at a grant writing workshop, Carpenter met Dr. Bryan Boulanger, assistant professor of environmental and water resources engineering from the Zachry Department of Civil Engineering at Texas A&M University (Churchill, 2009). As water systems and environmental management are his areas of expertise, Boulanger contributes the technical perspective, ensuring the safety and efficiency of the filters produced by the group. In 2009, Dr. Alicia Dorsey, the Vice President of the Texas A&M Health Science Center, was invited to participate in the collaboration, as an expert in the field of rural health. Hernandez and Wukich continue to serve as creative and technical consultants.

Each collaborator has students with whom they work, as well as a long list of drop-in volunteers. The diversity in terms of age, experience, field of study, perspective, area of research, and ability leads to rich and multilayered discussions and innovations in the development of the collaboration as an organization. Since its inception, the TAMU Water Project has grown to include multiple aspects of work: Filter Fridays, conference presentations, hands-on demonstrations, fieldwork in and around the *colonias*, networking at academic functions, writing for peer-reviewed journals, creating formal curricula, speaking to student organizations, curating art exhibits, medical missions abroad, prototyping new filter shapes, creating a virtual filter factories for educational purposes, etc. The unique combination of personalities, purposes, and perspectives ensure that no two events are alike. Much like the parable of Stone Soup, participants contribute as they are willing, working toward a common goal, building something out

of nothing. At each event or meeting of the TAMU Water Project, the collective efforts result in surprising, satisfying, and mutually beneficial outcomes that are much greater than the sum of the parts.

Amongst the members of the collaborative, there is an understanding of the project as an open-source, non-proprietary embodiment of justice, in which members are motivated to contribute for a variety of reasons. The group is not intending to impose, convert, monopolize, or profit from any of the practices or projects, nor do Water Project collaborators explicitly solicit community partners. In fact, the immediate focus of the groups is to establish a water filter production facility so that associates of the Water Project have the first hand experience in building a facility based on appropriate technology and local resources. Essentially, members are concerned with teaching themselves the process, so that they may have the first-hand experience to teach others.

At no point is there any discussion of what the Water Project will get in return, charge for services, or gain for the projects. In this sense, the work of the TAMU Water Project connects academia to public life through an open invitation to respond to water disparity as a practice of freedom, rather than as a practice of domination. In so doing, the public praxis of the Water Project provides a means of empowerment that enables learners to be both engaged citizens and active participants in the struggle for global water justice.

While collaborators often discuss these intentions of the Water Project, evidence is somewhat elusive as most of the existing material was written by non-participants, many of which have different conceptions of the project. Some misalignment stems from

misunderstanding the contexts, misunderstanding the issues of poverty, or relying on embedded stereotypes and/or biases to inform assumptions. However, using critical environmental justice as a theoretical framework and lens will help to draw on the existing body of documentary evidence so as to understand the TAMU Water Project as a pedagogy of conscientization, minimizing the misalignment and/or misunderstanding.

Having fully explored the nuanced layers of context influencing the Water Project, we can establish a point of reference, which may serve as a model for other applications of this educational theory. In doing so, critical environmental pedagogy may evolve into a praxis of conscientization, altering our approach to creating sustainable social change through non-formal education. With the tools and most influential layers of context established, we grounded our discussion of the history and purpose of the TAMU Water Project. We will now turn to both the direct and indirect evidence that supports the Water Project as a model of critical environmental justice.

CHAPTER VII

ANALYSIS AND DISCUSSION

To examine how the TAMU Water Project functions as a pedagogy of critical environmental justice, the material evidence will be analyzed to demonstrate how the work of the project fulfills the criteria proposed by the theoretical framework. Particularly, how does the Water Project function to fulfill the criteria of critical environmental justice, including:

- 1) a non-hierarchal approach,
- 2) recognition of indigenous culture and knowledge,
- 3) a recovery of the community commons, and/or
- 4) a sustainable ecology for future generations.

Non-Hierarchal Approach

On Filter Fridays, an assortment of collaborators, students, and volunteers meet in the research and development studio, also known as Carpenter's garage, to make filters, discuss side projects, coordinate future events, and visit with the fellow colleagues. No one person is in charge, nor are detailed work plans made ahead of time, except for an occasional e-mail warning of a change of venue. All are welcome to contribute to the collective efforts, and decisions are made by group discussion and informal consensus. Participants drop in between two and five o'clock, ready for anything. Most Fridays, the group is involved in some aspect of filter production, those

who know the process coaching those who are new. All hands are busy as the workers visit, share and catch up with colleagues from other departments. In the film *Clean Water for Texas*, Carpenter explains:

On some afternoons for Filter Friday, we don't make filters. But we think, we talk about ideas. We say "here's part of the issue, here's part of what we are trying to work with," and to have a scientist, an artist, an engineer, a philosopher, a community worker all coming at the same issue from different perspectives... that's unbelievable. The richness of that discussion is incredible (Texas A&M University, 2009).

Students are mentored within the project using a similar non-hierarchical approach. Projects are student-designed, and student-centered, developed simultaneously with the other Water Project work. Much like a botanical rhizome, such as ginger or bamboo, in which multiple distinct stems grow out of a shared rootstock (Figure 11), the TAMU Water Project supports multiple distinct projects developed by a shared collaboration working toward water justice. In this way, the Water Project is continuously able to nurture the next generation of collaborator/advocates.

Recent examples of student work include: Ishan Desai, who wrote a master's thesis discussing mercury removal from water using metal oxide nanoparticles; and partners Julie Michelon and Shreyas Erapalli who conducted research into the viability of small scale plug-shaped water filters that fit into the top of a common water bottle. Education graduate students Angela Cornelius and Ernestine Sherow have worked to compile lessons for the online blog, and has partnered with Carpenter in implementing lessons at the local high school. Similarly, I worked with education graduate student Cory Arcak and engineering student Rachel Thompson to create a week long hands-on

camp curricula for middle grades students related to global water issues. Each semester the list of related side projects grows.

Figure 11.
Bamboo rhizome



(PHILINSHELTON. (2009). *Bamboo Plant Parts II: Culm*. <http://halfsidebamboo.info/http://halfsidebamboo.info/wordpress/188/bamboo-plant-parts-ii/>)

The non-hierarchical structure of the internal partnership is also reflected in the external collaborations, as the TAMU Water Project approaches community partnerships. By practicing an interdisciplinary pedagogy of social justice in which all people are valued as equal contributors, the work disrupts the power dynamic of prevailing models of research in which the researcher is regarded as the expert. In recognizing communities and residents as equal contributors to the research, the Water Project works to minimize biases and unequal power dynamics, while investing in the

enrichment of the community as a group of collaborators, rather than objectified subjects.

The TAMU Water Project recognizes the cultural dissonance experienced by *colonia* residents and operates out of a strength-based approach, working *within* existing contexts, *with* the residents themselves, in order to fully understand and prioritize culturally and contextually-relevant actions. "Our mission is to connect *colonia* residents--people who feel very isolated--to as many services as possible" Muñoz explains (as cited in Bounds-Socol, 2009, p. 25). In using the word research as a verb (to research *with*), rather than the noun (to do research *on*), the power dynamic becomes non-hierarchical, operating as community based participatory research, encouraging innovation through open-source knowledge sharing.

In particular, evidence of this can be observed in how participants learn how to make filters. Carpenter writes,

As they become more proficient and knowledgeable about the skills and technology necessary for the successful production and use of filters, learners become teachers and help others to gain necessary information... This passing along of knowledge for shared benefit resembles a traditional apprenticeship model but renegotiates the relationship, as an implied power structure is not present (2008, p. 34).

Although much of the work involved in producing water filters is non-hierarchical and communal, labor can be gendered according to the particular culture. Communal does not mean that every person contributes in exactly the same way. Specifically, in many countries around the world, "mostly women and children... have to walk large distances to get their water" (Hernandez, 2008, p. 35), and any work related to water is considered the role of a woman or girl. Similarly, mechanical work and construction is

strongly associated with men's work. As the manufacture of filters (masculine) for the purpose of household drinking water (feminine) seemingly combines the two aspects of gendered labor, different cultures may assign the role to one gender over the other.

Whereas the outcome may vary from one culture to the next, the TAMU Water Project works within existing structures, considering all community members equally valuable participants.

For example, this past March, members of the TAMU Water Project travelled to the Dominican Republic Filter Pure water filter factory to assist in relief efforts for Haiti, in response to the devastation caused by the earthquake. Student Rachel Thompson travelled with two male colleagues from Texas A&M University, and was included in all of the teaching aspects at the filter production facility. However, when the group was assigned the task of producing kiln bricks, she noticed that she was regarded differently than her male colleagues (R. Thompson, personal communication, April 16, 2010).

Unsure and slightly uncomfortable about how to proceed, Rachel noticed the strict division of labor, in which the women were responsible for household work, while the men were occupied with working out in the community. Had Rachel been a local, she would have known which aspects of the work were culturally appropriate for her to participate in, but because Rachel was a foreigner, she was exempt from the local norms of gendered work. Consequently, Rachel chose to occupy herself with aspects of work that were culturally acceptable that contributed to the group efforts.

Through both implicit and explicit means of knowledge dissemination, best practices in filter building are easily passed from one community member to the next,

and one generation to the next. A similar approach can be observed in how health information is shared between Water Project participants and community members. Muñoz and Kelly (2009) explain, "integration of health literacy with the development of a water project in the *colonias* of south Texas... increase[d] health literacy through community based participatory activities" (6th paragraph). Curricula developed by Water Project partners is non-proprietary, with plans of all materials soon being available online in the format of an interactive community. Some lessons are already available. "Students created curriculums (*sic*)....and posted them on the TAMU Water Project blog for other teachers to download and use" (Sutton-Jones, 2009). Eventually, the website will feature a listing of water-related lessons, where contributors can share context-specific best practices, growing as a non-hierarchal, non-proprietary online community (Carpenter, B. S., personal communication, August, 26, 2009).

Individuals and communities are mentored through a learning process that is non-hierarchal in its approach, responding to the critical matters relevant to the lives of the learners. In so doing, traditional power dynamics are challenged, and learning becomes a discovery of local issues, that enable "meaningful learning experiences that reflect on, respond to, and participate in our contemporary, pluralistic global society" (Carpenter, 2008, p. 33)

Recognition of Indigenous Culture and Knowledge

Do not push the river. It will flow by itself. – Polish proverb

Every community has a unique history, with local cultural practices, norms, expectations, resource management concepts, and community priorities. Many of these cultural components are learned implicitly over time within each community. Local culture is embedded in every interaction amongst members of a community, the way that water from the river flows through every aspect of an ecosystem. Much the same way that pushing the river may be considered wasted efforts in changing its speed or course of the flowing water, imposing non-native water solutions will do little to affect local culture regarding culturally-specific water use and practices.

First steps in working with any community includes listening and learning about the local customs and issues surrounding water. In this way, researcher/educators can go with the flow of the local culture, rather than pushing against it. The Water Project uses “a modern variation on one of the oldest technologies--pottery--to help people clean up their own water” Boulanger explained in an interview, "Clay and working with ...a kiln is a familiar skill in every culture in the world except for the Pacific islands...But everywhere else, this knowledge exists, so the localized knowledge to help...is already there" (Charleton, 2009, p. 49). By drawing on the indigenous knowledge of place, the Water Project works within existing social structures, so that improvements to water and health are integrated into the flow of the local culture, rather than being imposed.

Hernandez, who has helped build over forty water filter facilities around the world, explains his first steps:

In my experience, the most important ingredient in establishing a filter production facility in a developing country is locating an experienced potter... The presence of an experienced potter also means that there is a source of clay and most likely a brick yard in the vicinity (2008, p. 336).

Vital to this work is the principle of appropriate technology, which refers to the practice of finding solutions in which all equipment and materials for fabrication, as well as the required labor and maintenance, is available locally (Hernandez, 2001). In many instances, this necessitates designs that can function in rural areas, with or without electricity, creating a custom-fit to the resources such as clay, combustible organic material, and fuel that are available immediately, and familiar to the locals. Through his work with Potters for Peace, Hernandez developed and taught Appropriate Technology workshops, which “focused on teaching local potters how to make ceramic water filters (CWFs) that would provide potable water wherever needed” (Hernandez, 2001, p. 96). One of his most widespread and useful inventions is the Mani kiln, specifically designed to fire ceramic water filters efficiently, amenable to a wide variety of climates and sources of fuel (Figure 12). While the major elements of the design remain consistent, the local culture and customs influence the materials, the fuel, and the orientation of each kiln, customizing it to the specific place-based contexts.

Figure 12.
Mani kiln as appropriate technology



a) building the Mani kiln in Cambodia



b) fuel injection system that uses
leaf-blowers to fire rice husks



c) Mani kiln in Uganda



d) Fueled by wood

Figure 12 continued.



e) Mauritania



f) Honduras

(Hernandez, M. (2006, January). How to Build a Kiln.
<http://www.vrac.iastate.edu/ethos/proceedings2006.php>

Hernandez, M. (2007, January). Building Energy Efficient Kilns for Firing Ceramic Stove Inserts. <http://www.vrac.iastate.edu/ethos/proceedings2007.php>

Recognizing the indigenous culture and wisdom of a particular place is important as a foundation of mutual respect. A common assumption made by dominant American society associates poverty with misery, often eliciting a response of pity for people of lesser economic means. Such individuals are often described using deficit models, emphasizing all of the aspects that are missing when compared to the “white picket fence” myth of mainstream American culture. To counterbalance this tendency, the TAMU Water Project operates out of a strength-based model, recognizing the local customs, culture, and wisdom of each new context and community.

An example of this practice occurred in June of 2009, when members of the TAMU Water Project combined indigenous knowledge with appropriate technology on a medical mission to Esmeraldas, Ecuador. "As a preventative measure against [water-borne] parasites, Dr. Bryan Boulanger and Oscar Muñoz from Texas A&M University worked with local church leaders to teach them how to make low cost ceramic water filters out of supplies in their community" (TAMU Health Science Center, 2009). In Esmeraldas, this began with collecting water samples, testing the local tap water for chlorination, teaching community members about water-borne illness, and viewing microorganisms under a microscope (Figure 13). Community members were surprised to learn that the water from their tap was untreated, containing as many microorganisms as the water collected from the river (O. Muñoz, personal communication, July 10, 2009). This conscientization, or critical awakening of the community members to their own water condition, prompted both intervention and advocacy within their community.

Recounting his experience, Muñoz explained that for the purpose of instruction, the filter design was scaled down from the traditional five-liter capacity filter, to one-liter capacity filters, using coconut shells, which are abundant, to create the filter mold. The preferred method of breaking up the local clay into small pieces involved filling a tire inner tube, tying the ends, and repeatedly slamming it on the ground until the large pieces were pulverized. While pottery-making is not common in Esmeraldas, there is a local brick maker with large firing ovens, and expertise in working with the local clay, perfect for firing the filters (Figure 14). At each step of the process, the local knowledge, indigenous and place-based, supported the application of appropriate technology.

Figure 13.
Indigenous knowledge and critical awakening in Esmeraldas, Ecuador.



a) Collecting water samples and data



b) Checking for chlorine in tap sample



c) Discussing water-borne illness



d) Viewing microorganisms in samples

(Texas A&M Health Science Center. (2009, August). Mission of service: Water Project. [photo disk]. College Station, Texas: Texas A&M University.)

Figure 14.
Use of indigenous knowledge and appropriate technology in Esmeraldas, Ecuador.



a) Coconut shell



b) Plaster mold of coconut shell



c) Miniature water filters



d) Local brickmaker's kiln

(Texas A&M Health Science Center. (2009, August). Mission of service: Water Project. [photo disk]. College Station, Texas: Texas A&M University.)

The practice of building on local culture and indigenous wisdom was evident in how the Water Project developed educational materials that “allow people to reproduce filters using cultural and community knowledge” (Churchill, 2009). In educational terms, the practice of teaching communities is student-centered, rather than teacher-centered, focusing on water issues for the purpose of improving community health, as each community context is unique and faces distinct place-based challenges.

Working effectively with the Texas *colonias* requires the expertise of locals. The TAMU Water Project recognizes the importance in partnering with the *promotoras*, who understand the *emic* perspective, as they are residents themselves. In his work with the *Colonias* Program, Muñoz has created a *promotora* training academy, designed to prepare *promotoras* with skills and practical background knowledge to support their work in the *colonias*. This concept of “homegrown advocacy” was the purpose that led the TAMU Water Project collaborators to acquire a site in Webb County, Texas, central to a few different *colonias*, on which a water filter production facility could be built. Not only will the facility begin producing water filters for the *colonia* residents, but it will also serve as a centralized training facility for the localized participants.

Much like the nature of water itself, the TAMU Water Project intentionally cultivates a culture of inclusivity that is fluid, universally relevant, and organic in its work toward water justice. Just as water conforms to the shape of the vessel carrying it, the Water Project conforms to the particular culture hosting each project whether the norms of gendered work, the improvisation of materials to make filters, or the training and partnership with *promotoras* in the Texas *colonias*. By recognizing the local culture

and indigenous knowledge of the people, the TAMU Water Project practices mutual respect, upholding the praxis of critical environmental justice as a pedagogy of conscientization rather than domination.

Recovery of the Community Commons

Humans are social beings, creating elaborate social networks, communication systems, and housing arrangements, with the health of the collective whole being related to the health of individuals. Bee colonies function in much the same way: each individual contributes to the health of the community, and the collective efforts, in turn, support life for each individual bee. The recent phenomenon of Colony Collapse Disorder illustrates how a deterioration of the collective efforts to support the commons can lead to the eventual collapse of the community. Some scientists believe changes in bee behavior are caused by a genetic predisposition to viral infection. The virus impairs the bee's ability to perform its role, contribute to, and interact with peers within the bee colony (Johnson, R., Evans, J., Robinson, G., & Berenbaum, M., 2009). Alone and unable to support itself without commons of its community, the bee dies. As more bees are infected, the colony eventually collapses.

Complex societies rely on the commons, which include the shared tangible and intangible things that people enjoy, but do not privately own, such as sunshine, clean air, safe surroundings, oceans, and cultural representations. In this age of corporate power, our commons are threatened daily by legal and economic systems, such as carbon emission caps and trades, which attempt to commodify the right to pollute clean air,

prioritizing profits over the shared wellbeing of people. A praxis of critical environmental justice intentionally challenges the hegemonic tendency toward commodification and consumption, shifting priority away from isolated individualism, and toward a recovery of the commons that build healthy communities.

Insight into the importance of commons can be seen by the responses given by participants when asked to explain motivation for continuing water justice work.

According to the TAMU Water Project collaborators, they do this work:

- because there is always need (Muñoz, in Texas A&M University, 2008)
- because of the overwhelming demand (Hernandez, 2001)
- because to ignore it is to empower the hegemony that oppresses us all (Carpenter, 2009)
- because it is satisfying to help others (Hernandez, 2001)
- because it is the right thing to do (Boulanger, in Texas A&M University, 2008)
- because even one person's life is worth saving (Wukich, 2008)
- because I am inspired to respond to real world living conditions (Carpenter, 2009)
- because we are at a land grant school, and are obligated to serve fellow Texans (Carpenter, in Kujawski, 2007)

These responses indicate a concern for others, not limited to their own communities.

Some answers also imply a moral obligation to respond to other people in need, as well as the desire to be of service to others. Underlying the motivation to continue working on water justice issues is an implicit understanding that a threat to our shared commons is a threat against our community, and in turn, a threat against our shared future. Brown explains, "The areas on both sides of the border face a common future. All the residents breathe the same air, increasingly depend on the same water, share a joint culture, enjoy the same parks, and suffer from the same diseases. They should face their problems together." (1997, p. 121)

When asked to explain the purpose of their work with the water project, the collaborators responded as follows:

- to reach out during a time of war (Wukich, 2008)
- to help provide clean water to those who need it (Muñoz, in Bounds Socol, 2009)
- to help the people with water, health, and job possibilities (Wukich, in Reyes, 2008)
- to inspire and empower my hometown and to create jobs for locals (Wukich, in Ramirez, 2010)
- to improve health and lower mortality (Hernandez, 2008)
- to prevent deaths and poor health, and because it saves lives (Boulanger, in Churchill, 2009)
- to be part of the solution (Hernandez, 2001)
- to reinvest in the community (Muñoz, in Bounds Socol, 2009)
- to embody an interdisciplinary public pedagogy of social justice (Carpenter, 2009)

Woven into these responses is a call to action, similar to what one might expect of firefighters, motivated to help those in need. Water Project participants seem to respond cognitively as well as emotionally, speaking to the multiple layers of meaning embedded in water justice work. In all examples, the responses refer to making connections with other people, contributing to the commons through service to others.

Corporate and government interests seldom coincide with those of communities such as the Texas *colonias*. Olmstead (2004) explains that municipalities and state agencies that control water service providers limit service to rural poor for because they are not legally mandated to serve all areas possible. Furthermore, it is not in their economic best interest to service areas that do not contribute to the city tax base. Therefore, rate regulation of water services benefits urban dwellers, but is a major factor in the lack of coverage among the rural poor. These systemic economic motivations in effect marginalize individuals and communities, cutting them off from the resources

vital to their health, not dissimilar to Colony Collapse Disorder suffered by bees.

Without access to a reliable healthy water source, all *colonias* suffer increased health issues and have fewer opportunities to redress their needs. While this process does not necessarily result in premature death for all residents as it does with the bees, it does decrease quality of life with regard to health.

Alternatives to the hegemony of profit-driven decisions do exist. Olmstead suggests that "pricing flexibility may be a key component of service expansion to *colonias*" (2004, p.148), increasing access without dramatically increasing overall cost to such access. Raising critical awareness among community members, both in the urban and rural contexts, can empower them as community collaborators so that water equity is the priority for all. Meaningful responses to shared community needs are what advance social justice and democratic society (Carpenter, 2010).

In working toward strengthening community commons, the TAMU Water Project works with communities to build filter productions facilities with the intention of turning over ownership to the community to do with as they decide. In some instances, the water filter production factory could be kept as a micro-enterprise, in others, it may be a community co-op. As an immediate consequence of the establishment of a new filter factory, access to clean water is improved for all community members, in turn, improving community health by decreasing the incidence of water-borne illness. In the longer term, the Water Project recovers community commons by working as and with community advocates to affect systemic change in the way of protecting and exercising the rights of the community.

Education functions as the mechanism that supports every aspect of the TAMU Water Project, both in specific community contexts, and also in the larger global context.

According to Carpenter,

Members of the TAMU Water Project conduct public demonstrations of the appropriate technology production of the ceramic water filters in public spaces at universities, schools, pottery studios, parks, and other sites. ...During the demonstrations, [participants] work with demonstration attendees to mix clay, produce filters using appropriate technologies, share information about the global water crisis, distribute handouts, and brainstorm ways to further the mission, outreach, and impact of the project... These workshops are a form of public pedagogy as embodied social justice and have become an effective means of reaching individuals and groups who may otherwise not attend more formal presentations. (2010, p. 339)

Whether the Water Project participants are teaching filter-making, water safety, community health, or advocacy skills within the rural communities, or, presenting at conferences, teaching university classes, and participating in acts of public pedagogy, education is fundamental to the strengthening of community commons.

Sustainability for Future Generations

In all aspects of the multi-stranded work, sustainability is a priority, defined differently by each layer of context. At the micro level, with regard to the water filters, sustainability means recyclability. The most common household failure of water filters is due to breakage. Rather than disposal in a landfill, the ceramic can be ground into a fine grog, and reincorporated into the wet clay mixture as a ceramic strengthener (M. Hernandez, personal communication, January, 20, 2009). In this way, the water filters may be indefinitely recycled. Similarly, the water filter production factories are designed using appropriate technology to ensure that all aspects of production can be produced or

salvaged on site. Hernandez declares, "You can set something up, but if it's not sustainable, it doesn't make sense." (cited by Schemer, 2008). Nearly all materials are bought or salvaged on site, in order to ensure sustainability.

As applied to the educational work, sustainability of the project partly relies on the work that involves youth. "Educational efforts have included a recent 5 day Water Camp for 4th - 8th grade students in El Paso, Texas, who investigated water resources, conservation, and treatment through art, science, teamwork, and field trips to water treatment facilities" (Muñoz & Badash, n.d.). In collaboration with students Cory Arcak and Rachel Thompson, I designed a thematic collection of lessons and inquiry activities, inclusive of both urban and rural learners that guide students to understand the specific place-based water issues in their community. Components of the curriculum are aligned with national standards, including language arts-, mathematics-, science-, and arts-based lessons. The unit was also designed to be modular, with lessons and activities that can be pulled out, rearranged or omitted according to the particular needs of the teacher, students, and particular community context.

Similarly, sustainability, in terms of continued public volunteerism, support, and awareness is facilitated through the use of a traveling exhibition of water receptacles, curated by Wukich. "The exhibition serves as a means to draw attention to the global water crisis and to promote humanitarian work and action," Carpenter shares. "The exhibition has traveled to galleries in Pennsylvania, West Virginia, North Carolina, Georgia, Michigan, Kentucky, Ohio, Texas, and Missouri, and has served as a vehicle for promoting social awareness" (Carpenter et al., 2010, p. 339).

Furthermore, sustainability, in terms of long term plans for the TAMU Water Project, include the recent acquisition of two sites, which will be used as training facilities. "The Webb County Commissioners Court agreed to provide space in Laredo, Texas, for the Project to build its first water filter production and education center" (Muñoz & Badash, n.d.). Similar plans have been made for a site at the Texas A&M University Riverside Campus. "Our facilities will be used for filter production, public demonstrations, workshops, classes, testing and research," elaborates Carpenter (as cited in Sutton-Jones, 2009). In this way, the work TAMU Water Project will be continued by new generations of scholars enrolled and affiliated with Texas A&M University.

Sustainability can also be described as the act of replacing oneself. In all aspects of the Water Project, participants and volunteers are encouraged to learn and participate as much or as little as they like. Responsibilities and opportunities are shared amongst participants, as are the challenges and successes. Students are nurtured and encouraged to pursue side projects related to the overall purpose of the TAMU Water Project, continuously cultivating a new generation of participant collaborators.

Discussion

While Muñoz may jokingly refer to his colleagues as “partners in crime,” their work toward water justice for the *colonias* proves that what they are is “partners in vision” (Churchill, 2009). The TAMU Water Project is distinct in its approach working toward water justice, embodying a re-conception of academic/community collaborations in four distinct aspects: by using a non-hierarchical approach, by recognizing indigenous

culture and knowledge, through a recovery of the community commons, by prioritizing a sustainable ecology for future generations. In so doing, the Water Project models a praxis of critical environmental justice, and disrupts the hegemonic structures of traditional academic research.

As a participant observer, my positionality within the project has afforded me access, a thorough comprehension of the layers of context, and a familiarity with the subtle shifts in approach that non-participants may not notice. Until I began the process of examining the extant evidence, I had not realized how little the participant collaborators had recorded as first-hand accounts of their work, nor had I recognized the number of factual errors about the TAMU Water Project found in print form.

Without accusing authors who have written about the project, I contend that the same biases, stereotypes and inaccurate generalizations found in mainstream discussions of the global water crisis, of poverty, and of life in the *colonias* can be found in discussions of the TAMU Water Project written by non-participants. Misrepresentations have included assuming that all participants have the title of “Dr.,” intentionally excluding members who were not “Dr.,” describing the work of the project parallel to evangelical work that “saves” people, and describing the *colonias* as a single town called “Colonius,” just to name a few. Some authors focus on the population of the *colonias* using deficit language that parallels stereotypes of poverty as being dirty, lazy, stupid, and/or an intentional choice, while others focus on telling the story of the smart, rich, American heroes that save the poor, helpless unfortunates. With each new article, the list of inaccuracies grows. Yet, despite these mistakes, many articles also contain evidence

of relative accuracy, in which the author portrays the Water Project without bias or assumption, allowing the collaborators to describe their work in their own words.

Furthermore, because the Water Project is associated with a well-regarded institution, the work of the TAMU Water Project is subjected to the same cultural/political attitudes characteristic of this and other top-tier research institutions. For example, the implicit belief in which a title is the indicator of expert aptitude, in which academics are considered authorities and communities considered research subjects, in which some fields of research are ascribed a higher value than other forms of research, and in which research may be considered distinct from daily life, and has little or no obligation toward positive social change. The TAMU Water Project intentionally disrupts each one of these embedded concepts, proposing a praxis of libratory public pedagogy that responds to humanitarian issues of water injustice *because it is the right thing to do*.

As demonstrated by the Water Project, the theory of critical environmental justice moves education out of the institutionalized classroom such that learning becomes a response to life itself, a reaction to/with the multiple layers of context that are the foundations our lived experiences. This does not deny that classrooms may continue to provide valuable skills, however, it does shift the priority toward activating the agency in each learner, so that they may respond to and shape their communities, and in turn, their own lives. Much like the ecology metaphor, connections can be visualized as a web inter-relating people, places, and resources, operating both as a collective whole, and as individuals dependent on the collective whole. Education, as envisioned by

critical environmental justice, is to awaken individuals to their inter-relatedness and empower them to affect positive change in even the smallest places.

CHAPTER VIII

CONCLUSION

In using thick description, “the aim is to draw large conclusions from small, but very densely textured facts; to support broad assertions about the role of culture in the construction of collective life by engaging them exactly with complex specifics.” (Geertz, 1973, p. 28). As a participant in the TAMU Water Project, my intention in this thesis was to present the work of the collaborative from the perspective of *participant observer* in order to capture the rich details and connections between the many aspects of the project. While education clearly plays a large role in the water justice work of the TAMU Water Project, the nature of the collaborative defies traditional, linear models and structures of education, and is not easily described by an existing educational theory.

Through an inductive process of collecting documentary material evidence, I found data that portrayed some aspects of the project accurately, while others less so, prompting closer consideration. As an attempt to frame the work of the Water Project, and to explore how it functions as a praxis of public pedagogy, I proposed critical environmental justice as the theoretical framework and lens through which to examine both the form and function of the TAMU Water Project. In so doing, critical environmental justice clarifies a particular conception of the Water Project, while the Water Project serves as an example of what the theory of critical environmental justice may look like in practice.

Borrowing from critical pedagogy, environmental justice, and place-based pedagogies, critical environmental justice seeks to question hegemonic practices and intentionally make visible issues of disparity and oppression within the layered contexts of lived experiences. Distinguishing characteristics of this framework include:

- 1) A Non-Hierarchical Approach, which is reflected in both the internal organizational structure and also the external community partnership models,
- 2) Recognition of Indigenous Culture and Knowledge, implemented using strength-based and culturally-relevant approaches,
- 3) A Recovery of the Community Commons, including non-commoditized aspects of public health, advocacy, and community empowerment, and
- 4) A Sustainable Ecology for Future Generations, evident in how the project nurtures the next generation, and minimizes its ecological footprint.

The purpose of the TAMU Water Project is to work toward global water justice simultaneously responding to both the global and local water inequities with accessible, low-cost, culturally-responsive appropriate technology, implementing point of use ceramic water filters to improve public health. The project developed as a creative response to the urgent water needs of people within the state of Texas, recognizing the embedded stereotypes and history of environmental racism that stall the systemic changes that would provide services to the *colonia* communities. The TAMU Water Project uses public pedagogy, critical awakening, and place-based social justice curricula to embody resistance to the systemic marginalization of rural communities along the border. The purpose has shaped both internal structure and external relations,

resulting in an organization that is non-hierarchical, contextually and culturally responsive, and able to simultaneously address issues of global water equity at various levels in the concentric rings of context.

By challenging the dominant power dynamic of academia/community partnerships, the TAMU Water Project is well-suited to partner with *colonia* communities in addressing water needs, as they are often misunderstood and misrepresented using traditional paradigms. When value is placed on the *emic* perspective, culture, and worldview, viable custom-fit solutions are accompanied by empowerment within the community, resulting in improved quality of life for the residents of the community. Not only does the TAMU Water Project fulfill the criteria of a pedagogy of critical environmental justice, it also serves as a benchmark example of what the theory looks like in practice: critical environmental justice is modeled as a pedagogical praxis of liberation rather than domination. Learners practice critical intervention in order "to display, foster, embody, expect, demand, nurture, allow, model, and enact inquiry toward change" (Ayers, 1998) so that they may "create healing and compassionate environments...which in turn will move outward to local communities and ultimately affect global ecological transformations" (Slattery, 2006, p. 223).

Thus, pedagogy is reconceived as a praxis of social justice that raises critical awareness to global and local issues, questions hegemonic structures, empowers marginalized communities, and seeks context-specific and culturally-sensitive solutions that are sustainable. The metaphor of education as an ecology of learning situates the practice within concentric rings of context centered on learners' lives. In implementing a

pedagogy of critical environmental justice, learners are awakened as global citizens, enabling a reflective, responsive, multidimensional understanding of local issues from a global perspective

Metaphors

Returning to the symbolic language that illustrates conceptions of what a praxis of critical environmental justice resembles, we can draw on the metaphors used to describe the TAMU Water Project. Today, hegemonic forces conceive of education as a medical practice, (in which students are diagnosed and treated), as a bank, (in which information is deposited into empty receptacles), or as a factory assembly line (in which standardized processes yield standardized results). However, critical environmental justice may more closely resemble:

- Bees in a hive, modeling interdependence between individuals and the community, the health and well-being of each being mutually sustained;
- The parable *Stone Soup*, in which each individual contributes a small portion, seemingly making something wonderful out of nothing, illustrating that the sum is greater than the individual parts;
- As the obligation of firefighters to respond to a need and serve; or
- As a botanical rhizome, in which multiple strands grow from a common rootstock representing a shared organizational goal.

Considering the four characteristic criteria of non-hierarchical, culturally-responsive, collectively-oriented sustainability, as well as the illustration of education as a process of

growth and development, I suggest the botanical rhizome as the metaphor most aligned with the praxis of critical environmental justice.

In particular, I suggest the metaphor of Pando, also called the Trembling Giant, which resides south of the Wasatch Mountains in Utah, and is the most massive living organism in the world. Discovered by research colleagues at the University of Colorado, the superorganism is “made up of 47,000 [aspen] tree trunks, each with an ordinary tree’s usual complement of leaves and branches, Pando covers 106 acres and, conservatively, weighs in excess of 13 million pounds” (Grant, 1993). Connected by a complex network of subterranean rhizomatic roots, each tree occupies a distinct place within the organism as a collective whole. Similarly, education, connected by a rhizomatic purpose of social and environmental justice, could be practiced as a place-based process of inquiry and growth, making meaning within the unique concentric rings of context in which we each live. In conclusion, if we return to the metaphor of the TAMU Water Project as a rhizome, a sturdy horizontal rootstock from which multiple stems sprout, I would similarly suggest that we reconceptualize the praxis of critical environmental justice education as a rhizomatic superorganism.

Future Work

Having established critical environmental justice as a praxis, the exploration of more examples of this type of work could serve to shift it from a praxis to a pedagogy. Similarly, to further explore the differences between internal identification and external perceptions of the praxis, a study that interviews collaborators directly may help

illuminate differences in understanding. Furthermore, the logistics of conscientization within the praxis are not yet clearly defined: To whom does this occur? Under what circumstances? How can conscientization be cultivated through pedagogical practice?

With regards to the TAMU Water Project, there are many possibilities for further study. Longitudinal studies of the water filter production/training facility at Riverside Campus (TAMU) and Webb County, Texas, may prove valuable in documenting the process of building and maintaining such facilities. Interviewing consecutive generations of participants to compare understandings and ideas would prove a valuable resource within the organization, as would a longitudinal study interviewing *colonia* residents before, during, and after the establishment of water filter facilities in their communities. Once established, studies comparing facilities between different *colonias*, as well as comparisons between *colonias* and other worldwide communities may be useful as well.

REFERENCES

- Ayers, W. (2001). Foreword. In W. Ayers, J. Hunt, & T. Quinn (Eds.), *Teaching for Social Justice: A Democracy and Education Reader*, (xvii-xxv). New York, NY: Teachers College Press.
- Bluemel, E. B. (2004). The implications of formulating a human right to water. *Ecology Law Quarterly*, 31(4), 957-1006.
- Bounds Socol, K. (2009, May). The fight for clean water. *Advance: Research, Scholarship, and Creative Achievement at Texas A&M University*, 22-25.
- Bourdieu, P. (1991). *Language and Symbolic Power*. (Raymond, G. and Anderson, M., Trans.) Harvard, MA: Harvard University Press.
- Bowers, C. A. (2002). Toward an eco-justice pedagogy. *Environmental Education Research*, 8(1), 21-34.
- Bowers, C. A. (2006). Silences and double binds: Why the theories of Dewey and Freire cannot contribute to revitalizing the commons. *Capitalism, Nature Socialism*, 17(3), 71-87.
- Bowers, C. A. (2008). Why critical pedagogy of place is an oxymoron. *Environmental Education Research*, 14(3), 325-335.
- Brown, T. C. (1997). The fourth member of NAFTA: The U.S.-Mexico border. *Annals of the American Academy of Political and Social Science*, 550, 105-121.
- Campbell, H., & Heyman, J. (2007). Slantwise: Beyond domination and resistance on the border. *Journal of Contemporary Ethnography*, 36(1), 3-30.
- Carpenter, B. S. (2007). *Stark Gallery Event*. [photos] Retrieved on October 25, 2009, from the World Wide Web: <http://picasaweb.google.com/bscarpenterII/TAMUWaterProjectImages?authkey=aAJ4uKn-UmM#>
- Carpenter, B. S. (2008). Clay and water: Toward a multi-linear pluralistic ceramics curriculum. *Confluence: Innovation, Community, Environment. The NCECA Journal*, 29, 33-35.
- Carpenter, B. S. (2009). Embodied social justice: Water filter workshops as public pedagogy. In J. Sandlin, B. Schultz, and J. Burdick (Eds.) *Handbook of Public Pedagogy: Education and Learning beyond Schooling* (pp. 337-340). New York: Routledge.

- Carpenter, B. S., Taylor, P. G., & Cho, M. (2010). Making a (visual/visible) difference because people matter: Responsible artists and artistic responses to community. In T. Anderson & K. K. Hallmark (Eds.) *Art Education Working for Social Justice* (pp. 60-66). Reston, VA: National Art Education Association.
- Charleton, G. (2009). DIY H2O: Taking water purification to where it's needed most. *Texas A&M Engineer: Engineering Research at Texas A&M University*, 48-50.
- Churchill, C. (2009, April 7). "Engineering water for the world Texas A&M University tackles a water crisis." *Texas Water Resources Institute TX H2O*, Spring. Retrieved on October 29, 2009, from the World Wide Web: <http://twri.tamu.edu/news/2009/04/07/engineering-water-for-the-world/>
- Denzin, N. K., & Lincoln, Y. S. (Eds.) (1998). *Collection and Interpreting Qualitative Materials*. Thousand Oaks, CA: SAGE Publishers.
- Environment News Service*. (2009, March 27). "Access to water: A human right or a human need?" Retrieved on December 20, 2009, from the World Wide Web: <http://www.ens-newswire.com/ens/mar2009/2009-03-27-03.asp>
- Ely-Yamin, A. (1993). Empowering visions: Toward a dialectical pedagogy of human rights. *Human Rights Quarterly*, 15(4), 640-685.
- Filter Pure*. (2009). Retrieved on October 29, 2009, from the World Wide Web: <http://filterpurefilters.org>
- Foster, R. E., Amos, W., Eby, S. (2005, August). *Ten years of solar distillation application along the U.S.-Mexico border*. Paper presented at the International Solar Energy Society Solar World Congress, Orlando, Florida. Retrieved on December 19, 2009, from the World Wide Web: <http://solar.nmsu.edu/publications/1437ISESpaper05.pdf>
- Freire, P. (1998). In A. M. A. Freire & D. P. Macedo (Eds.), *The Paulo Freire Reader*. New York, NY: Continuum.
- Garcia-Acevedo, M., & Ingram, H. (2004). *Conflict in the Borderlands*. (Report on Water). New York, NY: North American Congress on Latin America.
- Geertz, C. (1973). *The Interpretation of Cultures: Selected Essays*. New York, NY: Basic Books.
- Giroux, H. A. (2009). Education and the crisis of youth: Schooling and the promise of democracy. *The Educational Forum*, 73, 8-18.
- Gleick, P. H. (1999). The human right to water. *Water Policy*, 1(5), 487-503.

- Gottlieb, E. E., & La Belle, T. J. (1990). Ethnographic contextualization of Freire's discourse: Consciousness-raising, theory, and practice. *Anthropology & Education Quarterly*, 21(1), 3-18.
- Grant, M. C. (1993 October). "The trembling giant." *Discover*. Retrieved on March 29, 2010, from the World Wide Web: <http://discovermagazine.com/1993/oct/thetremblinggian285>
- Greene, M. (1998). Introduction. In W. Ayers, J. A. Hunt, & T. Quinne (Eds.) *Teaching for Social Justice: A Democracy and Education Reader* (pp. xxvii-xlvi). New York: Teachers College Press.
- Greuenewald, D. A. (2003a). A critical pedagogy of place. *Educational Researcher*, 32(4), 3-12.
- Gruenewald, D. A. (2003b). Foundations of place: A multidisciplinary framework for place-conscious education. *American Educational Research Journal* 40(3), 619-654.
- Gruenewald, D. A. (2005). More than one profound truth: Making sense of divergent criticalities. *Educational Studies: A Journal of the American Educational Studies Association*, 37(2), 206-215.
- Gruenewald, D. A. (2008). The best of both worlds: A critical pedagogy of place. *Environmental Education Research*, 14(3), 308-324.
- Hardberger, A. (2006). Whose job is it anyway? Governmental obligations created by the human right to water. *Texas International Law Journal*, 41(3), 533-568.
- Heierli, U. (2008). *Marketing safe water systems: Why is it so hard to get safe water to the poor - and so profitable to sell it to the rich?* Retrieved on February 9, 2010, from the World Wide Web: www.poverty.ch/documents/Safewater.pdf
- Hernandez, M. (2001). Appropriate technology in developing countries. *Evolving Legacies: The NCECA Journal*, 22, 96-102.
- Hernandez, M. (2006, January). How to Build a Kiln. Presented at the 2006 ETHOS: Engineers in Technical and Humanitarian Opportunities of Service Conference, Northwest University, Kirkland, Washington. Retrieved on February 9, 2010, from the World Wide Web: <http://www.vrac.iastate.edu/ethos/proceedings2006.php>
- Hernandez, M. (2007, January). Building Energy Efficient Kilns for Firing Ceramic Stove Inserts. Paper presented at the 2007 ETHOS: Engineers in Technical and Humanitarian Opportunities of Service Conference, Northwest University,

- Kirkland, Washington. Retrieved on February 9, 2010, from the World Wide Web: <http://www.vrac.iastate.edu/ethos/proceedings2007.php>
- Hernandez, M. (2008). On saving the world. *Confluence: Innovation, Community, Environment. The NCECA Journal*, 29, 35-37.
- Johnson, R., Evans, J., Robinson, G., & Berenbaum, M. (2009). Changes in transcript abundance relating to colony collapse disorder in honey bees (*Apis mellifera*). *Proceedings of the National Academy of Sciences of the United States of America*, 106(35), 14790–14795. doi: 10.1073/pnas.0906970106
- Kujawski, J. (2007, September). “Carpenter plans water filter demo Wednesday as part of ceramic art exhibit.” *Teaching, Learning, and Culture News*. Retrieved on December 21, 2009, from the World Wide Web: http://tlac.tamu.edu/articles/carpenter_plans_water_filter_demo_wednesday_as_part_of_ceramic_art_exhibit
- Leonard, C. W., Vera, B. E., Liebman, A. K., Bessenecker, C., & Mercado, M. (1996, July). “Improving the quality of drinking water in *colonias* in the in Ciudad Juárez-El Paso area.” *Border Environment Research Reports* (Number 3). Retrieved on December 12, 2009, from the World Wide Web: <http://www.scerp.org/docs/berr3.html>
- May, M. L., Bowman, G. J., Ramos, K. S., Rincones, L., Rebollar, M. G., Rosa, M. L., et al. (2003). Embracing the local: Enriching scientific research, education, and outreach on the Texas-Mexico border through a participatory action research partnership. *Environmental Health Perspectives*, 111(13), 1571-1576.
- McLaren, P., & Houston, D. (2004). Revolutionary ecologies: Ecosocialism and critical pedagogy. *Educational Studies*, 36(1), 27-45.
- Merriam, S. B. (2009). *Qualitative Research*. San Francisco, CA: Jossey-Bass Publishing.
- Mondragon, D., & Brandon, J. (2004). To address health disparities on the US-Mexico border: Advance human rights. *Health and Human Rights*, 8(1), 178-195.
- Moreno, S. (2004, August 2). Shantytowns migrate far north of the border in Texas; Weak county laws tied to the spread of squalid developments. *The Washington Post*, pp. A3.
- Muñoz, M., Muñoz, O. J., Arcak, C. (2010, February). Clean Water for Texas: A transdisciplinary approach. Paper presented at the Seventh Annual Abriendo Brecha Conference, University of Texas, Austin.

- Muñoz, O. & Badash, M. (n.d.). "TAMU Water Project: A photo slideshow about potters, engineers, housing experts, and medical staff working together for clean water." Retrieved on December 21, 2009, from the World Wide Web: http://www.healthliteracy.com/hlm_article.asp?PageID=9168
- Muñoz, O., & Kelly, E. (2009, October). When more than a treatment is needed: Integrating health and literacy at the community level. Paper presented at the meeting of the San Antonio Literacy Coalition and Health Collaborative, 5th Annual Health Literacy Conference, San Antonio, Texas.
- National Atlas of the United States*. (2009). Retrieved on March 2, 2010, from the World Wide Web: http://nationalatlas.gov/articles/agriculture/a_ivalley.html#one
- Olmstead, S. M. (2004). Thirsty *colonias*: Rate regulation and the provision of water service. *Land Economics*, 80(1), 136-150.
- Oyanedel-Craver, V. A., & Smith, J. A. (2008). Sustainable colloidal-silver-impregnated ceramic filter for point-of-use water treatment. *Environmental Science Technology*, 42, 927-933.
- Parsons. (2009). *All American Canal*. Retrieved on March 2, 2010, from the World Wide Web: <http://www.parsons.com/projects/Pages/all-american-canal.aspx>
- PHILINSHELTON. (2009). *Bamboo Plant Parts II: Culm*. Retrieved on March 2, 2010, from the World Wide Web: [http://halfsidebamboo.info/wordpress/188/bamboo-plant-parts-ii/](http://halfsidebamboo.info/http://halfsidebamboo.info/wordpress/188/bamboo-plant-parts-ii/)
- Potters for Peace*. (2006). *Filters*. Retrieved on October 28, 2009, from the World Wide Web: http://s189535770.onlinehome.us/pottersforpeace/?page_id=9
- Quick, R. (1996). Low-cost safe water for the world: A practical interim solution. *Journal of Public Health Policy*, 17(4), 389-408.
- Ramirez, C. (2010, February 8). "Braddock man's water filter project could help Haiti." *Pittsburgh Tribune-Review*. Retrieved on December 21, 2009, from the World Wide Web: http://findarticles.com/p/news-articles/tribune-review-pittsburgh/mi_8018/is_20100208/braddock-mans-water-filter-project/ai_n49430115/
- Reyes, E. (2006, August 31). "Colloidal silver combats water problems in Iraq." Retrieved on November 3, 2009 from the World Wide Web: <http://www.utopiasilver.com/emailtemp/articlepages/silverfiltersiraq.htm>
- Santa Ana, O. (2002). *Brown Tide Rising: Metaphors of Latinos in Contemporary American Public Discourse*. Austin, TX: University of Texas Press.

- Scanlon, J., Cassar, A., & Nemes, N. (2004). *Water as a human right?* (IUCN Environmental Policy and Law Paper No. 51). Cambridge, UK: the International Union for Conservation of Nature and Natural Resources.
- Schemer, D. (2008). "Ceramist brings clean water to the world." *UMass Dartmouth Sustainability Initiative*. Retrieved on December 12, 2009 from the World Wide Web: http://www.umassd.edu/sustainability/news_umd_2008_12_01_filters_Hernandez.cfm
- Schmidt, C. W., & Scott, J. (2000). Bordering on Environmental Disaster. *Environmental Health Perspectives*, 108(7), A308-A315.
- Slattery, P. (2006). *Curriculum Development in the Postmodern Era*. New York: Routledge.
- Stevenson, R. B. (2008). A critical pedagogy of place and the critical place(s) of pedagogy. *Environmental Education Research*, 14(3), 353–360.
- Sumaya, C., Carrillo-Zuniga, G., Kelley, M, May, M., Zhi, L., & Donnelly, K. C. (2006). Linking research to health promotion in Texas *colonias*. *American Journal of Health Studies*, 21(4), 245-252.
- Sutton-Jones, K. (2009). "Water Project granted production and education facilities." *Texas A&M Engineering News*. Retrieved on November 12, 2009 from the World Wide Web: <http://engineering.tamu.edu/news/index.php/2009/02/26/water-project-granted-production-and-education-facilities/>
- TAMU Water Project blog. (2008). Retrieved on November 4, 2009 from the World Wide Web: <http://tamuwaterproject.wordpress.com/>
- Texas A&M University. (Producer). (2009). *Clean Water for Texas*. [video] Retrieved on November 12, 2009 from the World Wide Web: <http://vimeo.com/7397412>
- Texas A&M Health Science Center. (2009, August). Mission of service: Water Project. [photo disk]. College Station, Texas: Texas A&M University.
- Texas Secretary of State. (n.d.). "Colonias FAQs." Retrieved on October 15, 2009, from the World Wide Web: <http://www.sos.state.tx.us/border/colonias/faqs.shtml>
- UNESCO World Water Assessment Programme. (2003). Water for people, water for life: Executive summary. *The United Nations World Water Development Report*. Paris: UNESCO Publishing.

- UNESCO World Water Assessment Programme. (2009). Water in a changing world: Overview of key messages. *The United Nations World Water Development Report 3*. Paris: UNESCO Publishing.
- Vanegas, J. (2009). *CHUD at a Glance*. Center for Housing and Urban Development, Texas A&M University, College Station, Texas.
- Williams, R. (2006). *Tracking the progress of state-funded projects that benefit colonias*. (Final Report in Response to Senate Bill 827 by Senator Judith Zaffarini and Representative Ryan Guillen). Retrieved on November 3, 2009 from the World Wide Web: www.sos.state.tx.us/border/forms/sb827_111706.pdf
- WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation. (2010). *Progress on sanitation and drinking-water: 2010 Update*. France: World Health Organization Press.
- Wukich, R. (2008). Saving the world: Overview. *Confluence: Innovation, Community, Environment. The NCECA Journal*, 29, 30-33.

APPENDIX A:

TAMU WATER PROJECT ARTICLES AND MEDIA

- Arcak, C., Muñoz, M., Cornelius, A., and Carpenter, B. S. (2010). Filtering Access Through Social Engagement: Artists, Community, and Curriculum. Art and Design for Social Justice Symposium Proceedings, Florida State University.
- Bounds Socol, K. (2009, May). The fight for clean water. *Advance: Research, Scholarship, and Creative Achievement at Texas A&M University*, 22-25.
- brenda. (2008, November 3). "IMSA® Team wins Lemelson-MIT InvenTeam Grant for invention Project." Retrieved on March 22, 2010, from the World Wide Web: <https://www3.imsa.edu/news/features/InvenTeam>
- Byrne Reilly, R. (2006, December 9). "A thirst to save 2 million children a year worldwide." *Pittsburgh Tribune-Review*. Retrieved on March 22, 2010, from the World Wide Web: http://www.pittsburghlive.com/x/pittsburghtrib/news/rss/s_483415.
- Carpenter, B. S. (2007). *Stark Gallery Event*. [photos] Retrieved on October 25, 2009, from the World Wide Web: <http://picasaweb.google.com/bscarpenterII/TAMUWaterProjectImages?authkey=aAJ4uKn-UmM#>
- Carpenter, B. S. (2008). Clay and water: Toward a multi-linear pluralistic ceramics curriculum. *Confluence: Innovation, Community, Environment. The NCECA Journal*, 29, 33-35.
- Carpenter, B. S. (2009). Embodied social justice: Water filter workshops as public pedagogy. In J. Sandlin, B. Schultz, and J. Burdick (Eds.) *Handbook of Public Pedagogy: Education and Learning beyond Schooling* (pp. 337-340). New York, NY: Routledge.
- Carpenter, B. S., Cornelius, A., Muñoz, M., and Sherow, E. (2009). (Re)Considering public pedagogy in/as art education: Engaging social justice and place based education. *Texas Trends*, 31-36.
- Carpenter, B. S., Taylor, P. G., & Cho, M. (2010). Making a (visual/visible) difference because people matter: Responsible artists and artistic responses to community. In T. Anderson & K. K. Hallmark (Eds.), *Art Education Working for Social Justice* (pp. 60-66). Reston, VA: National Art Education Association.
- Charleton, G. (2009). DIY H2O: Taking water purification to where it's needed most. *Texas A&M Engineer: Engineering Research at Texas A&M University*, 48-50.

- Churchill, C. (2009, April 7). "Engineering water for the world Texas A&M University tackles a water crisis." *Texas Water Resources Institute TX H2O*, Spring. Retrieved on October 29, 2009, from the World Wide Web: <http://twri.tamu.edu/news/2009/04/07/engineering-water-for-the-world/>
- SRU Good News. (2010, January, 29). "CNN's Anderson Cooper features SRU's Richard Wukich tonight." Retrieved on March 20, 2009, from the World Wide Web: <http://www.sru.edu/pages/16207.asp>
- Filter Pure. (2009). Retrieved on October 29, 2009, from the World Wide Web: <http://filterpurefilters.org>
- Hernandez, M. (2001). Appropriate technology in developing countries. *Evolving Legacies: The NCECA Journal*, 22, 96-102.
- Hernandez, M. (2006, January). How to Build a Kiln. Presented at the 2006 ETHOS: Engineers in Technical and Humanitarian Opportunities of Service Conference, Northwest University, Kirkland, Washington. Retrieved on February 9, 2010, from the World Wide Web: <http://www.vrac.iastate.edu/ethos/proceedings2006.php>
- Hernandez, M. (2007, January). Building Energy Efficient Kilns for Firing Ceramic Stove Inserts. Paper presented at the 2007 ETHOS: Engineers in Technical and Humanitarian Opportunities of Service Conference, Northwest University, Kirkland, Washington. Retrieved on February 9, 2010, from the World Wide Web: <http://www.vrac.iastate.edu/ethos/proceedings2007.php>
- Hernandez, M. (2008). On saving the world. *Confluence: Innovation, Community, Environment. The NCECA Journal*, 29, 35-37.
- "HSC pioneers international interdisciplinary medical service-learning team." (2010). Retrieved on March 22, 2010, from the World Wide Web: <http://tamhsc.edu/pulse/issues/winter2010/ecuador.html>
- Kujawski, J. (2007, September). "Carpenter plans water filter demo Wednesday as part of ceramic art exhibit." *Teaching, Learning, and Culture News*. Retrieved on December 21, 2009, from the World Wide Web: http://tlac.tamu.edu/articles/carpenter_plans_water_filter_demo_wednesday_as_part_of_ceramic_art_exhibit
- Lavender, C. (2008, November 10). "Water for the weary: Aggies work to provide water in US communities near border." *The Battalion*. Retrieved on March 20, 2010, from the World Wide Web: <http://www.thebatt.com/2.8483/water-for-the-weary-1.1184505>

- McGuire, C. (2005, April 1). "Professor travels to Sudan to aid in water projects." *The Rocket*. Retrieved on March 22, 2010, from the World Wide Web: http://www.theonlinerocket.com/home/index.cfm?event=displayArticle&ustory_id=ed4f089a-8104-48f2-bc08-465c983d30f9
- Moore, K. (2010, February 5). "SRU professor travels to Haiti, provides clean drinking water." *The Rocket*. Retrieved on March 22, 2010, from the World Wide Web: <http://media.www.theonlinerocket.com/media/storage/paper601/news/2010/02/05/News/Sru-Professor.Travels.To.Haiti.Provides.Clean.Drinking.Water-3865659.shtml>
- Muñoz, M., Arcak, C., & Thompson, R. (2009) Water Camp Curriculum. College Station, Texas: Texas A&M University.
- Muñoz, M., Muñoz, O. J., Arcak, C. (2010, February). Clean Water for Texas: A transdisciplinary approach. Paper presented at the Seventh Annual Abriendo Brecha Conference, University of Texas, Austin.
- Muñoz, O. & Badash, M. (n.d.). "TAMU Water Project: A photo slideshow about potters, engineers, housing experts, and medical staff working together for clean water." Retrieved on December 21, 2009, from the World Wide Web: http://www.healthliteracy.com/hlm_article.asp?PageID=9168
- Muñoz, O., & Kelly, E. (2009, October). When more than a treatment is needed: Integrating health and literacy at the community level. Paper presented at the meeting of the San Antonio Literacy Coalition and Health Collaborative, 5th Annual Health Literacy Conference, San Antonio, Texas.
- Nelson Jones, D. (2009, February 8). "Braddock shop helps clean Third World countries' water: Mini-factory turning out ceramic cones that filter bacteria." *Pittsburgh Post-Gazette*. Retrieved on March 22, 2010, from the World Wide Web: <http://www.post-gazette.com/pg/09039/947753-82.stm#ixzz0j2jpKZnt>
- Ovenshine, G. (2006, November 15). "Slippery Rock University art professor receives NAACP award for humanitarian work." Retrieved on November 4, 2009 from the World Wide Web: <http://www.sru.edu/pages/13533.asp>
- Ramirez, C. (2010, February 8). "Braddock man's water filter project could help Haiti." *Pittsburgh Tribune-Review*. Retrieved on December, 21, 2009, from the World Wide Web: http://findarticles.com/p/news-articles/tribune-review-pittsburgh/mi_8018/is_20100208/braddock-mans-water-filter-project/ai_n49430115/

- Reyes, E. (2006, August 31). "Colloidal silver combats water problems in Iraq." Retrieved on November 3, 2009 from the World Wide Web: <http://www.utopiasilver.com/emailtemp/articlepages/silverfiltersiraq.htm>
- Rivera, R. (2007). "Design for the other 90%: Panel Discussion with curator Cynthia E. Smith." Retrieved on March 2, 2010, from the World Wide Web: <http://video.cooperhewitt.org/design-for-the-other-90-ron-rivera-coordinator-of-ceramic-water-filter-and-international-projects-potters-for-peace>
- Ryan, K. (2007, October 2). "Purifying water through pottery." *The Battalion*. Retrieved on December 18, 2009, from the World Wide Web: <http://www.thebatt.com/2.8485/purifying-water-through-pottery-1.1189130>
- Schemer, D. (2008). "Ceramist brings clean water to the world." *UMass Dartmouth Sustainability Initiative*. Retrieved on December 12, 2009 from the World Wide Web: http://www.umassd.edu/sustainability/news_umd_2008_12_01_filters_Hernandez.cfm
- Schmitt, J. (2007). "Honduras Mission Trip January 2007 (Page 4)." Retrieved on March 2, 2010, from the World Wide Web: <http://hmmb.org/NewsletterP4.htm>
- Schnettler, T. (2009, February 26). "Water project granted production and education facilities." Retrieved on February 18, 2010, from the World Wide Web: <http://engineering.tamu.edu/news/index.php/2009/02/26/water-project-granted-production-and-education-facilities/>
- Schwab, K. E. (2006, October 26). "Slippery Rock University to host 3-day water filter conference for project designed to help developing nations solve drinking water shortage." Retrieved on March 2, 2010, from the World Wide Web: <http://www.sru.edu/PAGES/13474.asp>
- Schwab, K. E. (2007, July 2). "Slipper Rock University art professor 'adopts' Afghan art school; promotes water project." Retrieved on March 20, 2010, from the World Wide Web: <http://www.sru.edu/pages/14266.asp>
- Sutton-Jones, K. (2009) "Water Project granted production and education facilities." *Texas A&M Engineering News*. Retrieved on November 12, 2009 from the World Wide Web: <http://engineering.tamu.edu/news/index.php/2009/02/26/water-project-granted-production-and-education-facilities/>
- Texas A&M University. (Producer). (2009). *Clean Water for Texas*. [video] Retrieved on November 12, 2009 from the World Wide Web: <http://vimeo.com/7397412>
- TAMU Health Science Center. (2009, January). "HSC pioneers international interdisciplinary medical service-learning team." Retrieved on December 21,

2009 from the World Wide Web: <http://tamuhsc.edu/pulse/issues/winter2010/ecuador.html>

TAMU Water Project blog. (2008). Retrieved on November 4, 2009 from the World Wide Web: <http://tamuwaterproject.wordpress.com/>

Tang, T. (2007, September 27). "Pottery for peace." *The Battalion*. Retrieved on November 4, 2009 from the World Wide Web: <http://www.thebatt.com/2.8485/pottery-for-peace-1.1189239>

Vanegas, J. (2009). *CHUD at a Glance*. Center for Housing and Urban Development, Texas A&M University, College Station, Texas.

Watson, J. (2009, June 21). "From depths of a library, water filters for the poor." *VOA Development Report*. Retrieved on March 22, 2010, from the World Wide Web: http://www.21voa.com/VOA_Special_English/Development_Report_5695.html

Watters, T. (2010). "MIT-2010: Travis Watters reporting from Ghana." Retrieved on March 20, 2010, from the World Wide Web: <http://cee.mit.edu/blogs/travisandreed>

Wukich, R. (2008). Saving the world: Overview. *Confluence: Innovation, Community, Environment. The NCECA Journal*, 29, 30-33.

VITA

Name: Marissa Isela Muñoz

Address: Texas A&M University
Department of Teaching, Learning, and Culture
Mail Stop 4232
College Station, TX 77843-4232

Email: munozbertka415@gmail.com

Education: Bachelor of Science in Wildlife and Fisheries Biology, 1999
Texas A&M University, College Station, TX

Cross-Cultural Learning and Development Multiple Subject
Teaching Credential (K – 8), 2004
New College of California, San Francisco, CA

Master's in Culture and Curriculum. 2010
Texas A&M University, College Station, TX

Experience:

2008 -2009 Department of Teaching, Learning, and Culture, Texas A&M
University. Teaching Assistant.

2009-2010 Journal of Curriculum and Pedagogy. Editorial Assistant